ENGINEERING NEWS.

Tribune Building, New York City.

GEO. H. FROST, PROPRIETOR.

SATURDAY, ARPIL 23, 1881.

THE Paris papers have a new electric light which for simplicity and power is to discount all at present existing or in embryo. Very effective experiments have been made in the presence of Dumas, the electrician. A strip of platinum one centimeter in width, and several meters in length was rendered luminous by an apparatus not larger than a hat box. It is the invention of two French engineers. A Belgian banker, Philippart, whose stupendous stock operations were before the courts a few years ago, is at the head of the new enterprise, which is termed "*La Force et la lumière*," and which promises to do away equally with small steam engines and big gas companies.

THE dinner of the Institution of Civil Engineers was the occasion of some amusing illustrations of the power and place which belong to the engineer—especially in the mind of savage races. King Cuffy was more frightened at the idea of having a telegraph through his dominions than with all the paraphernalia of war. Lord Kimberly stated this as a fact, and added: "The guild of engineers has become a political power, and their work has probably produced a greater political effect than all the wars of the present century." Lord John Manners and the American ambassador were equally felicitous in their appreciations of the "maker and master of the modern world."

TO CITY ENGINEERS.

The unsolicited testimony of many engineers in favor of ENGINEERING NEWS as a medium for advertising all kinds of contract work warrants us in calling especial attention to this feature of its usefulness. It took several years to establish this department of contract advertising on a paying basis; at a large expense for newspapers, clerical labor and composition, we each week published gratuitously as many contract proposals as we could find, till our space becoming insufficient for our paid advertisements, and our expenses continuing to increase, we were obliged to admit scarcely any but paid for advertisements. This class of advertising has now become the especial feature of this journal, and every indication points to its steady increase. The officers of the U. S. Engineer Corps were the first to extend a considerable patronage, and to them we are much indebted for many columns each year of government advertising, from which we feel certain as good results are obtained as from any single journal in the country, whether it be the great city daily with its thousands of circulation, or the local papers of the district where the work is located. City engineers, water-works trustees, and more recently railway engineers, have found it to their profit to use our columns to advertise their work, and we have the most flattering testimonials from many of these as to the value of such advertising. And it is reasonable that it should be so above all other newspaper advertising. We venture to say that more men engaged in planning and constructing public works read this journal every week—either as regular subscribers, in reading rooms, or in the offices of subscribers—than they do any other class journal in America. Years are beginning to tell, and, notwithstanding our increase in price, we have never had such a run of new subscriptions kept up at so steady a rate so far into the season as we have this year.

Now we invite the especial attention of every engineer who has the letting of contract work to the advantages that our advertising columns offer to insure competition. Our rates are only *Ten cents* per line, per insertion, and twelve lines make one inch. This rate is as cheap as that of the most obscure country weekly, while the value of the advertisement in reaching the notice of the "picked men" among engineers and contractors, is greater than if it were inserted even in such papers as the New York *Herald* or *Sun* with their great circulations, the bulk of which after all does not extend beyond the city limits and the adjacent cities and towns.

To reach the manufacturers of water, gas, or sewer pipe necessitates the time of a clerk, the stationery and postage, and whether the advertisement be small or large it cannot be duplicated and distributed as cheaply by any other method as it can through ENGINEERING NEWS. Make a trial and see for yourself. The season for active work is at hand and if you want to save money in the first cost of soliciting bids, and then in the saving from the increased competition resulting from advertising, make it a point to patronize this journal whenever an opportunity offers. We will be very much obliged for the increase in our revenue and we know that our patrons will add to their popularity for their wise wethod of attending to the interests intrusted to them.

HUMBER'S WATER SUPPLY OF CITIES AND TOWNS.

We have been so much engrossed in other subjects that we have for many months neglected to urge upon the notice of our readers the above valuable treatise. All the while, however, its sale has been quietly progressing, until only a few copies remain on our shelves. We cannot too earnestly urge upon those who want such a work the necessity of securing it while the price is so accessible. Its advance to nearly its original price of sixty dollars is but a question of time, and that perhaps not as long as many may suppose. A good many copies have been bought by dealers for the purpose of holding for the advanced price, as they know that another edition is out of the question. This book is unlike Drinker's "Tunneling," and similar high-priced books, in that it was not electrotyped, and on account of its great cost of production and the limited demand for it, another edition will not be printed. Recollect that it is quite equal to the original in everything, and yet is at present only one-third of the price. There never was a time when more water-works were in construction or in expectation of such, than at the present time, and this is the only book that treats the whole subject in a satisfactory way. The price is TWENTY DOLLARS, and it will not be cheaper, but will rather increase in price as the edition is sold out. It will be sent, prepaid, to any address on receipt of the above price. The "History of American Water-works," which we are now publishing, has awakened new interest in water-works construction, and the sale of Humber's book has felt the good effects thereof. We hope to be able to dispose of the whole edition by the end of the year.

PERSONAL.

Mr. T. A. Carnegie, of Pittsburgh, Pa., is about establishing a free library for the benefit of his employés. The building will cost $20,000.

J. A. Latcha is Chief Engineer of the New York, Chicago & St. Louis Railway, with office at 32 Board of Trade Building, Cleveland, Ohio.

F. A. Nobert, a producer of test plates for microscopists, who has just died over the water, was able to rule plates at the rate of 224,000 lines to the English inch.

The partnership heretofore existing between R. W. Sherman, of Utica, and Emmett Flagler, of Troy, N. Y., contractors, has been dissolved by mutual consent.

L. W. Woodward, who has been superintendent of the North Adams (Mass.) Water-works for two or three years, has resigned to work for the Arnold print-works company.

Edward Huntington, of Rome, N. Y., died on the 17th, aged sixty-four years. He was one of the civil engineers for the building of the Utica & Schenectady Railroad and for the enlarging of the Erie Canal.

Fred. Grant has forwarded his resignation as First Lieutenant in the Fourth Cavalry and Lieutenant-Colonel on the staff of the Lieutenant-General of the Army. Mr. Grant will accept a position in the employ of the Chicago, Texas & Mexican Central Railroad Company.

Mr. R. I. Reckie, of Montreal, died in London on the 16th. He was at one time a partner in the great railway contracting firm of Peto, Betts & Brassey, which built the Grand Trunk of Canada. He was the largest shareholder in the Consolidated Bank of Canada, and its failure seriously impaired his fortune.

Edward Cren, for many years the leading architect and builder in Wheeling, West Va., died in that city Wednesday last, aged 87 years. He was born near Havre de Grace, marched to the defense of Baltimore in 1814, and has been drawing a pension under the act of Congress granting pensions to the veterans of the war of 1812. He located in Wheeling in 1817.

The Central Bridge Works, whose New York office is 52 Wall street, have purchased the extensive bridge works formerly owned by the late Kellogg Bridge Company, of Buffalo, N. Y., and, having greatly improved the same, are now prepared to furnish iron, steel or combination bridges, viaducts, roofs, or other structures of the most approved designs and workmanship at minimum rates. With a thoroughly scientific knowledge of the business in all its details, many years of practical experience, ample means and close connection with the best manufacturers of iron and steel, the company express themselves as always prepared to insure satisfactory results.

V. D. Simar and W. S. Morton, civil engineers, St. Paul, Minn., have formed a co-partnership in that city for carrying on a regular engineering business in that section of country. Mr. Simar has had an extensive practice in government works and in some of the prominent railways of the Southwest. Mr. Morton, who is a son of the celebrated "War Governor" of Indiana, was an assistant engineer in the South Pass Jetties, under E. L. Corthell, and more recently has been engaged on government work, as assistant engineer, under the orders of Col. F. U. Farquhar, at Rock Island, and Major Chas. J. Allen, at St. Paul, of the U. S. Engineer Corps. The new firm are prepared to undertake all kinds of professional work that may be required of them, and we wish them great success in their new venture.

Mr. Rudolph Hering, Assistant City Engineer of Philadelphia, sailed last June on behalf of the city of Philadelphia as Special Commissioner of the U. S. National Board of Health, Washington, to examine the different systems of sewerage in the principal cities of Europe, to report on their relative efficiency with regard to much-needed improvements in Philadelphia, and also to collect for the government the latest results of the various methods of draining towns and disposing of sewage. He visited London, Liverpool, Birmingham and all the principal towns in England where any special experience has been gained, extending his trip as far north as the Craigentinny Meadows, Edinburgh, where sewage has been used in irrigating farming lands for nearly 200 years. Crossing

to the Continent, he inspected the celebrated sewers of Paris and the fields of Gennevilliers, where the sewage is utilized. Especially interesting were the cities of Hamburg, where the first systematic sewerage works were ever built; Frankfort-on-Main, the best drained city in the world; Berlin, which on account of its size, the absence of a large river, and being nearly on a dead level, offers a most difficult problem in drainage; and Munich, where elaborate studies have just been completed in preparation for the entire re-sewering of the city. Next in interest were Vienna, where this matter has been very thoroughly treated; Zurich, whose engineer is the pioneer of Continental sewerage improvements, and Amsterdam, where the best example of the much-talked-of Liernur system can be seen. He had the pleasure of meeting nearly all of the prominent engineers and sanitarians interested in sewerage in England, France and Germany, and returned on the 18th with perhaps the most complete collection of books, reports, drawings, specifications, etc., on this subject to be found in the United States. Mr. Hering has for several years past given especial attention to sanitary engineering, his position as engineer in charge of the sewers of Philadelphia giving him particular advantages, to which he has added the benefits of unremitting study and observation. Already regarded as an authority on sewerage matters, the experience of the past year of travel and study must place him in the front rank of that branch of the profession which is now rising to especial prominence in Europe and America.

In order to recuperate from the effects of hard work and climate, Mr. E. L. Corthell, Assistant Engineer on the Survey of Capt. Eads' Tehuantepec Ship Railway route, has returned, and is at present with his family at North Egremont, Mass. Mr. Williams, Assistant Engineer, remains to complete the work left unfinished by the auxiliary Mexican Commission who assisted Capt. Eads in his exploration. A line *through* from gulf to ocean, not fully accomplished by the commission, is the work to be done, and this work Capt. Eads is doing without the assistance of the government. Capt. Eads is now in the city of Mexico, securing the ratification of his concession by the Mexican Congress.

THE HISTORY AND STATISTICS OF AMCAN WATER-WORKS.*

BY J. JAMES R. CROES, M. AM. SOC. C. E.

(*Continued from page* 153.)

CINCINNATI, CONTINUED.

Eden Park Reservoir was begun in 1866. The upper basin was brought into service in 1875, and the lower in 1878.

It lies in a deep, rapidly-descending ravine, and, to utilize it for reservoir purposes, a retaining wall was constructed, 119 ft. high, 48½ ft. wide at the base, 22 ft. wide at bottom of reservoir, and 25.8 ft. wide on top. Its extreme length is 1,251 ft. It contains about 76,000 perches of building stone.

For support of the part of road-way there are 8 elliptical arches constructed on the outer face of the wall, each 55 ft., by 18 ft. rise.

These arches, as well as the copings and pilasters, are finished with dressed Dayton stone.

The southwestern portion of the lower basin is of filled ground 85 ft. in depth. The division wall is 30 ft. wide at base and 10 ft. at top, and 400 ft. in length, including effluent and influent chambers.

At the west end of this wall the effluent chamber is located, and the influent pipes at the other end.

The outlet for effluent pipes was made by tunneling through the hill. The structure is made of four courses of brick on cement, is 12 ft. diameter and 1,100 ft. long, and cost $73,000.

*Copyright 1881.

The total cost of this improvement was $1,660,000. The upper division contains 57 million and the lower 43 million gallons.

An iron tank for Western Hill high service, erected in 1880, is 100 ft. in diameter by 48 ft. in height, and is made of Siemens-Martin steel. The plates are from ¼ to ⅝ in. thick.

The main works in which are located the pumping engines for the supply of the low and middle services are situated on the bank of the Ohio River, about three-quarters of a mile from the centre of the city, and about 5 miles within its upper line.

The water is taken from the river near its channel, and about 100 ft. from the river front of the pump house, and conducted through iron pipes and stone aqueducts to the pump wells.

In low water two 40-in. iron pipes furnish the principal portion of the supply to the pumps.

These lie on the bed of the river and extend 40 ft. from the stone wall which forms the outer limit of the aqueducts. There are two aqueducts, one 5 ft. and the other 20 ft. in width.

In the large aqueduct there is a 60-in. wrought-iron pipe, intended for an independent supply for the large engine, but owing to the irregular operation in the past of this engine, the pipe is now packed with river deposit.

Owing to the extreme fluctuations in the river, ranging nearly 60 ft., the suction pipes of pumps are placed below low water mark, and the pumps within the proper vacuum lift during extreme low stages. The engines, on the other hand, are placed above high water mark. The No. 6 engine-house is water-tight for extreme stages, while from the main building the water can be kept out for heights under 33 ft.

The water of the Ohio River at Cincinnati is gathered from a drainage area of about 77,700 square miles, 8,000 square miles of which near the city furnish water strongly impregnated with salts of lime. The hardness of the river water varies throughout the year in proportion to the contribution from the limestone basin.

The water is subject to contamination, owing to the situation of the works within the city limits. The eddy of the Deer Creek Canal caused much pollution, which was brought to the attention of consumers in a marked manner in 1867 by the burning of a large distillery on the canal. The whiskey found its way into the canal, thence into the river, where it was carried by this eddy into the pumps, and then delivered to the water consumers.

The sinking of loaded barges temporarily destroyed this eddy, and afterward the aqueducts were extended and new shore lines formed, which remedied this evil.

At the time of the purchase of the water-works by the city in 1838, the water company had laid 117,843 ft. of wooden pipe, bored logs of 2½ in. diameter, and 20,243 ft. of iron pipe, mostly of 3 and 4 in. diameter. All pipe laid since that time have been of cast-iron.

The proportion of small pipe is great, 103 miles out of 189 being less than 6 in. diameter. There are now, however, no pipe laid of less than 6 in. diameter.

The small pipes, particularly at dead ends, have been much obstructed by sediment from the water, and within a few years great improvement has been effected by connections for circulation and by frequent blowing out.

Owing to the peculiar topography of the city, there was a good deal of difficulty for many years in arranging the distribution. In Nov., 1877, the city was divided into three district services, but the mains not having been originally laid in contemplation of this division, the circulation of water in some parts is very bad, and a number of dead ends were unavoidable. These are being corrected as fast as possible.

The city is now supplied by two 35-in. mains from Eden Park (middle service) Reservoir and two 20-in. mains from the low-service reservoir.

The low service is supplied from the old Third Street Reservoir and embraces the low elevations South of Third street, Eastern avenue to its terminus and west of Baymiller street to State avenue. It also furnishes water for two-thirds of the hydraulic elevators.

The flow line of the reservoir is 170 ft. above low water mark in the Ohio River. The lowest point on the street it supplies is about 60 ft., and the highest point 100 ft. above low water. The average pressure at fire plugs is about twenty-five pounds. It furnishes 33 per cent. of the total water supply.

The middle service is supplied from the new or Eden Park Reservoir, from which the high service also takes its supply. The flow line of the reservoir is 232 ft. above low water mark. The lowest point on the street it supplies is above 60 ft., and the highest 180 ft., above low water mark. The average pressure at fire plugs is 45 pounds.

The high service takes its supply from the main feeder from Eden Reservoir, under a head of 60 ft., and forces it into two tanks, situated on the summit of Mt. Auburn, against a head of 340 ft (friction included). From this point the water is distributed (or rather partly so, for these tanks are merely stand-pipes to keep up the head, as part of the distributing pipes are directly connected with the pump main) to the higher levels. It requires nearly one per cent. of the water supply to satisfy this demand, which is rapidly increasing.

Another high-service works is in course of erection for the supply of the western hills. The flow line of its tank will be 520 ft. above low water mark. The pumps will have an average load of 140 pound to the sq. in.

The population, pipeage and consumption every tenth year have been:

Year.	Population.	Miles of Pipe.	Daily consumption in millions of gallons.
1840	46,338	24.27	1.08
1850	115,436	45.76	2.40
1860	161,044	83.68	4.82
1870	216,239	133.08	10.44
1880	255,708	188.86	19.48

The use of meters was begun in 1860, and there are now 545 in use. Hydraulic elevators began to be used in 1872, and at present 318 take water from the city mains. The ram created by them has caused an excessive number of leaks in the old pipes.

Under a general law of the State of Ohio, passed in 1853, the water-works were under the control of a board of three trustees, elected by the people, until 1876, when a Board of Public Works was constituted, composed of five members elected by the people. In 1879 the Board of City Commissioners was formed.

The executive officers of the works have been as follows:

Superintendents.	Engineers of Pump Works.	Civil Engineers.
1849..E. Hinman.	T. R. Scowden.	.....
1851..Lewis Warden.	"	.....
1854..James Cooper.	Lewis Warden.	.....
1857..S. W. Irwin.	Americus Warden.	.....
1859..R. C. Philips.	George Shield.	.....
1861..J. B. Earnshaw.	"	.....
1863..T. J. Weaver.	"	.....
1865..Joseph P. Mayer.	"	H. Earnshaw.
1867.. "	John G. Richardson.	"
1871..Henry Earnshaw.	"	"
1873..Gassaway Brasheurs.	R. T. Scowden.	.....
1874..Gassaway Brasheurs.	Americus Warden.	.....
1876..William Kirton.	"	.....
1878..James E. Bell.	"	.....
1879..A. Warden.	"	C. H. Boeckh.
1880..Arthur G. Moore.	"	"

The cost and revenue of the works have been as follows:

Construction	$6,509,583.10
Operation and maintenance	3,399,640.89
Interest on bonds	1,241,804.79
Total cost	$11,140,028.78
Revenue	9,014,523.78
Outstanding bonds	1,625,000.00

IX.—SAN FRANCISCO.

San Francisco, California, is in latitude 37° 48′ 26″.6 N. and longitude 122°, 24′ 39.6″ W. on the northern end of a peninsula 6 miles wide, and 20 miles long, separating the South arm of San Francisco Bay from the Pacific Ocean. Its area is 42 square miles, including several islands. Nearly half the area is a high rocky hill, rising at several points to 800 ft. above the sea.

There is now quite an extended area of level land created by grading, and the filling in of 300 acres of the Bay. The business part of the city covers about one square mile.

It was first settled in 1776 as a Spanish military post and mission. In 1835 a town was founded called Yerba Buena, which was changed to San Francisco in 1847, when it had 450 inhabitants.

In 1850 there were 34,000 and in 1860 56,000 inhabitants.

In 1857 the San Francisco Water-works Company, a private corporation, was organized with a capital of $1,500,000, which in 1864 was increased to $2,000,000.

In June, 1858, the Spring Valley Water Company was organized, with a capital of $60,000, increased in 1860 to $3,000,000. These two companies were consolidated in 1865, and the capital stock placed at $6,000,000.

In 1868 the capital was increased to $8,000,000, and in 1876 to $16,000,000.

Water is supplied to the city by the Spring Valley Water Company from three sources.

On Lobos Creek, four miles from the city, a storage reservoir, called Mountain Lake, impounds the flow from 2.5 square miles drainage area. The water, which is of excellent quality, being mainly the yield of slow percolation through sand, is conducted by a conduit, partly of wood and partly of masonry, for 23,700 ft. to Black Point, and there delivered at the zero of city elevations, and is forced by two condensing engines, each of 40-in. cylinder and 48-in. stroke, working two pumps, one of 14-in. bore and 84-in. stroke, the other of 12-in. bore and 60-in. stroke, into two reservoirs on Russian Hill, respectively 396 and 139 ft. above city datum. The ordinary yield of this source is 2.25 million gallons per day.

In the mountains of San Mateo County, 15 miles from San Francisco, a dam was built in 1864, impounding the waters of Pilarcitos Creek, which has a drainage area of 3.75 square miles. The dam is of earth, 640 ft. long, 26 ft. wide on top, with slopes of 2¾ and 2½ to 1, and is 95 ft. high. A puddle trench is sunk 26 ft. below the natural surface to rock.

After the reservoir was filled a leak appeared at one end of the dam, which was found to be caused by unsound rock in the foundation at that point. A shaft was sunk through the bank 80 ft. deep, the rock removed and replaced with puddle. The reservoir was full at the time. The dam is now tight.

The water surface is 692 ft. above the sea. The reservoir is 46 ft. deep, and contains 1,083 million gallons.

An additional drainage area of about two square miles is made tributary to this reservoir, by the construction of a wooden flume about five miles in length, with a cross-section of 42 by 16 in., intercepting the water of several streams which empty into Pilarcitos Creek below the dam.

From the dam, the water is conveyed partly by flume and partly by a 30-in. wrought-iron pipe, for 13 miles to Laguna Honda Reservoir, 377 ft. above tide, with a depth of 29 ft. and capacity of 33,000,000 gallons; thence by a 16-in. cast-iron pipe to the upper Russian Hill Reservoir on Lombard street, 306 ft. above tide, 22 ft. deep, and holding 3,724,000 gallons.

Another supply is brought from the water-shed of Lock's Creek, of 3.75 square miles area, at 505 ft. above tide. The water is conducted by a wooden flume, wrought-iron pipes and tunnels lined with masonry, a distance of 17.42 miles to the San Andres Reservoir, which is formed by an earth dam, 640 ft. long, 25 ft. wide on top, and 93 ft. high, besides a puddle trench, 47 ft. more to rock. The water surface is 449 ft. above tide and the storage capacity 7,000 million gallons. The tributary water-shed is about 4 square miles.

The San Mateo Creek is also brought into this reservoir by flumes and pipes. The water of the Pilarcitos, below the dam on that stream, is conducted to this reservoir, which receives the drainage of 10.81 square miles. The water is taken to the city by a conduit of 30-in. and 22 in. wrought-iron pipe for 64,000 ft., and delivered into the College Hill Reservoir, which, at 252 ft. above tide, has 15 million gallons capacity, and is 18 ft. deep.

In 1877-8, a further supply was procured from Crystal Spring by the erection of a dam 50 ft. high, forming an impounding reservoir of 3,830 million gallons capacity, receiving the drainage of 15 square miles. The dam, when completed, will be 82 ft. high, the water 304 ft. above tide, and the supply will be conducted to the city through 21 miles of iron 40-in. pipe. In the drought of 1877 steam pumps were placed at the dam, lifting water to the nearest point on the Pilarcitos conduit 635 ft. above tide.

The various conduits comprise about 154,000 ft. of wrought-iron pipe, of from 37.5 to 22-in. diameter, and 123,000 ft. of wooden flumes and tunnels.

The wrought-iron pipe is laid following the contour of the ground. The thickness of the metal is proportioned to the head under which it is used, with a strain of 15,400 to 13,100 lbs. per sectional inch of iron.

The city is supplied in three distinct services. The lower service, taking one-half the supply, is drawn from the lower Russian Hill Reservoir on Francisco street, at 139 ft., and the Brannan Street Reservoir at 85 ft. elevation. The middle service, taking one-sixth of the supply, is drawn from the College Hill Reservoir at 252 ft., and the Market Street Reservoir at 196 ft. elevation. The latter reservoir has a depth of 15 ft. and capacity of 225,000,000 gallons.

The upper service, taking one-third of the supply, is drawn from the Laguna Honda, at 377 ft., the upper Russian Hill reservoir at Lombard street at 306 ft., and the Clay street tank at 375 ft. elevation.

The tank is 9 ft. deep and holds 140,000 gallons.

Of the distribution pipe 10 per cent. are of 3-in. and 4-in. diameter. There are 220 miles of cast-iron pipe in use for distribution.

The consumption of water in 1865 was 2,367,000 gallons, in 1870 6,039,808 gallons, in 1875 11,000,000 gallons, and in 1880 about 17,000,000 gallons daily. The population in 1880 was 233,956.

The works have been built after the plans and under the direction of Herman Schussler, C. E.

The cost of the works to 1875 had been $8,746,928.12, the receipts $13,448,490.30, and the amount paid in dividends to stockholders $4,701,562.18.

The annual expenses of maintenance were reported at $300,000 in 1879. The water rates are directed by law to be determined by commissioners appointed by the city authorities.

X.—NEW ORLEANS.

New Orleans, Louisiana., in lat. 30° N., long. 90° W., is between the east bank of the Mississippi River, 115 miles from its mouth, and the westerly shore of Lake Pontchartrain, with a frontage of 13 miles on the curved river and seven miles on the lake, 5 miles distant. This area lying below high water level of both the lake and the river, is inclosed with embankments or levees to protect it from floods, and is drained by canals, from which the water is pumped over the levees.

The built up portion of the city is about six miles long on the river, with an average width of a mile and a quarter, in which area are 26,500 dwellings, occupied by 216,140 persons.

Founded in 1718 by the French, the supply of water was drawn entirely from cisterns and wells until 1836, when a private corporation constructed works for taking water from the river.

The population at that time was 70,000. The river water has been used for street washing, fire protection and to some extent for drinking, but the rain water collected in cisterns is still the chief dependence for drinking purposes of a large number of the inhabitants.

The water of the wells is very impure; borings to the depth of 87 and 95 ft. have failed to procure good water. Water is pumped from the river into two reservoirs 1,000 ft. distant, the first serving to some extent as a settling basin, and the second as a distributing reservoir.

The head of water did not average more than 15 ft. in the upper portion of the city, and below Canal street none was to be depended on of late years except at night.

In 1868 the city purchased the works of the company for $1,300,000. The supply continued poor both as to quantity and quality.

In 1878 the city sold the works to a private company, and authorized the issue of $600,000 of bonds for their improvement. A compound Knowles pumping engine of 5 million gallons capacity was put in and a stand-pipe erected by which the minimum head in the city is increased to 40 ft.

To the old distribution pipes, which were too small and in bad condition, several miles of new pipes are now being added. The improvements now in progress are after the plans of Moses Lane, C. E.

The aggregate pumping capacity is 26 million gallons per day. The population is 216,140.

XI.—CLEVELAND.

Cleveland, Ohio, on the southerly shore of Lake Erie, in lat. 41° 30′ N., long. 81° 46′ W., lies on both sides of the Cuyahoga River, the valley of which is but little above the level of the lake, with the ground rising on each side to an elevation of 120 ft.

Settled about 1810, its population in 1853 was about 25,000, when the construction of water-works was begun, after the plans and under the superintendence of Theodore R. Scowden, C. E.

The water was taken from Lake Erie, 300 ft. from the shore. Two double rows of piles were driven in concentric circles, 12 ft. apart, in 12 ft. of water, the outer circle being 30 ft. in diameter and the inner 10 ft. The space between the circles was filled with stones and the piles capped and tied together. An opening 4 ft. below the lake surface admitted the water to the inner well, from which it was conveyed through a wrought-iron pipe, 50 in. in diameter, for 300 feet to the shore, whence a brick oviform conduit, 4x5 ft., conveyed it 3,550 ft. to the pump well, the foundations of which rested on two courses of 12-in. timbers, 1 ft. apart, with the spaces filled with concrete.

On this platform was a flooring of large stones, on which stone inverted arches were built supporting the walls of the engine foundation and well. Two Cornish beam engines coupled together, with 70-in. steam cylinders of 120-in. stroke, pump plungers having 30-in. diameter and 106-in. stroke, with a combined capacity of eight million gallons per day, lifted the water 150 ft. through a 24-in. main 3,000 ft. long to a reservoir 20 ft. deep, with earth banks lined with 2 ft. of puddling faced with brick laid in cement, the whole reservoir being built on an earth embankment 21 ft. high. Its capacity is six million gallons. The clay puddling slipped a little in 1877, but was repaired without much trouble. It is now in good condition.

A stand-pipe 36 in. diameter and 148 ft. high was erected also at the pump house.

In 1874 a pair of Henderson's compound duplex

engines of ten million gallons per day capacity were added, and in 1876 a pair of compound Worthington engines of ten million gallons capacity. Another pair of similar engines are nearly completed.

For carrying the water across the river, a 24-in. wrought-iron main was laid 17 ft. below water surface. This was broken by the dragging of an anchor in 1876, and a new pipe put in of 36-in. diameter, 25 ft. below surface. Another pipe had been laid across the river in 1866.

The water near the shore becoming polluted by drainage, a tunnel was built under the lake for 6,661 ft. It was begun in 1869, and completed March 2, 1874.

Its depth below the water surface at the outer end is 90.2 ft., and at the shore end 67.5 ft.

The terminal crib is pentagonal, 54 ft. on a side. The well is 19 ft. on a side, and the walls 24 ft. thick and 61 ft. high.

During the sinking of the crib two severe storms occurred, which produced disturbance and excessive settlement of the structure, amounting to 11 feet in depth.

Great difficulty was encountered in the construction of the tunnel from quicksand, water and inflammable gas. An iron shield had to be carried ahead of the work for part of the distance.

A part of the tunnel cracked and sunk badly, and it was necessary to build a new branch around that section of it.

The work was successfully accomplished, however, under the direction of John Whitelaw, the Chief Engineer. A stone superstructure was erected on the crib in 1878.

Cast-iron pipe are used for distribution. Between 1858 and 1867 a considerable amount of wrought-iron and cement pipe was laid, much of which has been taken up and replaced with cast-iron pipe.

The use of meters was begun in 1862, and on Dec. 31, 1877, 248 were in use, and 18 hydraulic elevators.

The population, pipeage and consumption each tenth year have been as follows:

Year.	Population.	Miles pipe.	Daily consumption in millions of gallons.
1860	43,417	30	0.71
1870	92,829	49.4	3.09
1880	160,142	125.6	10.18

The cost of the original works was $523,000. The total cost of construction and operation to Jan. 1, 1878, had been $2,402,354.43, and the income had been $684,117.35. The bonded indebtedness was $1,725,000.

The works are controlled under the general law of Ohio by three trustees. Joseph Singer was Engineer and Superintendent from 1858 to 1866, and John Whitelaw from 1867 to 1881.

(To be continued.)

CORRESPONDENCE.

CONCERNING ASTRONOMICAL INSTRUMENTS.

Beverly, Mass., April 18, 1881.

Editor Engineering News:

In answer to the inquiries of your correspondent, Mr. Arthur Haviland, I can perhaps furnish the information he needs. He will find Chauvenet's Practical Astronomy a complete work "on the use of the portable transit in obtaining latitude and longitude."

If he wishes (as I suppose he does) to obtain his local time, and thereby his longitude and then his latitude in the quickest and most accurate manner possible with a *portable* instrument, he needs a combination of the transit and zenith telescope such as has been used on the Coast Survey for the last ten years for obtaining the latitude of stations, and also the local time and differences of longitude by telegraph from some standard station whose longitude has been well established. These instruments are called on the Survey meridian telescopes, and are made by Fauth & Co., of Washington. I have used them at Salt Lake City, Sherman, Wy., Aspinwall, San Blas and Caledonia Bay, on the Isthmus of Darien, while astronomer to Telfridge's first naval expedition, and also in 1868 at several stations in Alaska. Directions for using both the transit and zenith telescope are to be found in Appendix No. 9 (for transit) and No. 10 (for zenith telescope) to Coast Survey Manual, and both these papers can be obtained at the Coast and Geodetic Survey Office, Washington, D. C. I should recommend Mr. Haviland to order of Fauth & Co. a 26-inch meridian telescope, which will cost about $800, I suppose.

Yours respectfully, A. T. Mosman,
Assist. U. S. C. and G. Survey.

ASTRONOMICAL SURVEYING.

Boston, April 19, 1881.

Editor Engineering News:

J. H. C. Coffin's Navigation and Nautical Astronomy, published by Van Nostrand, 1865, is recommended to your Mexican correspondent to explain astronomical observations with surveying instruments by,

Yours truly, F. B.

SURVEYING INSTRUMENTS.

New York City, April 21, 1881.

Editor Engineering News:

Please inform "Young Engineer," of Vicksburg, Miss., that all the instruments used in the field-work of "Surveying, Laying Out and Monumenting the New Ward s of New York," were obtained of Stackpole Bros., northwest corner of Fulton and Pearl streets, New York.

Respectfully yours, S. S. Haight.

P. S. Only the Chief Engineer of our work has the title of "Topographical Engineer," therefore the final "*s*" should be omitted in my concluding article, where I stated that the department construction is temporarily in charge of the Topographical Engineer.

PROBLEM FOR ENGINEERING STUDENTS.

Pennsylvania Railroad Co.,
Blairsville, April 16, 1881.

Editor Engineering News:

I not agreeing with the answers published in regard to "K. M. Puter's" problem, offer the following:

To question 1. Yes. 2. $147.40. 3. Yes. 4. $125. 5. Loss. 6. $101.70. Respectfully,
R. B. Evans.

Water Commissioners' Office.
Detroit, April 8, 1881.

Editor Engineering News:

Answer to "Problem for Engineering Students" in Engineering News of April 2, 1881:

1. Yes. 2. $22.40. 3. No. 4. —. 5. Lose. 6. $101.70. Case.

LEVEL RODS AND LEVELING.

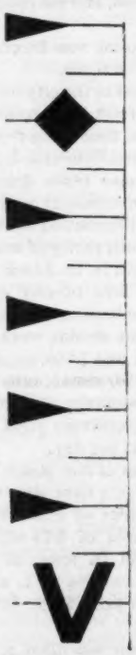
Saginaw City, April 4, 1881.

Editor Engineering News:

Mr. Cain gives a description of a self-reading level rod, which he prefers, in Engineering News of April 2. I have used several different patterns, but find none that suit me as well as one of my own construction. I send you a diagram which will explain itself. It can be of any width; but if you wish to use a target, a rod 1½ inches square is a very good size. It is sometimes convenient to use one at "change points" to guard against errors in reading the rod. After you have read it carefully yourself, have the rodman set the target and read it for you and see if the two readings agree. As the rod is divided to half-tenths, you can divide this space to hundreths by the eye as accurately as though more closely divided on the rod. When the rod sits 50 ft. or more from the instrument, you can see more than half a foot of the rod, and can count up or down from the foot or half-foot mark, which would thus be brought into the field of view, thus avoiding the necessity of covering so much of the face of the rod with figures, which become indistinct at long distances. I have read my rod with a 16-inch Y-level, of Stackpole make, distinctly 1,200 feet from the instrument, and usually read it 660 ft. or 40 rods each way, making four settings to the mile, where the ground is level enough to permit it.

In 1871 I ran two lines of levels for the F. & P. M. Railway with such a level and rod, one on each side of the Pere Marquette River, 20 miles, making a circuit of 40 miles, and closed with two-tenths error, and I have frequently run long circuits with equally good results. I mark my foot divisions with the figures that can be read the farthest, using part letters and part numerals, thus: I II III 4 V 6 7 8 9 X XI, all in black, on white background.

I do not like his method of keeping field-notes, as it takes up the whole page and leaves no space for calculating the grade, cut and fill, and also requires computation in the field. A man generally has all he can think of to keep his instrument properly leveled, take his observations and record them in his book, without making computations at the same time. I send you a plan which I prefer, as occupying four columns instead of seven, making less computations, an equal chance to test his work, and less liability to make mistakes because you do your field work first, and then sit down calmly with nothing else on your mind and make your computations, going through with your "change points" first. We will take his example: Set down the elevation of your B. M., 100.00; adding your back-sight (t) 4.65, gives 104.65 height of instrument; from this subtract your first fore-sight (∨), 15.98= 88.67 elevation of first "change point;" to this add second (t), 2.21 = 90.88, height of instrument, second setting. To test this, find the difference between your first ∨ and second (t), = —13.77, which is the difference in height of instrument at the two settings. Continue in the same manner till you have completed the chain of levels, whether it is one page or 100 pages; then, if you wish to further test your computations, take a separate piece of paper and set down all of your ts and add them with the elevation of your first B. M. and from this sum subtract the sum of all your ∨



Level Rod.

When you are satisfied that your "change points" are correct, then subtract your observations at each

Sta.	Obs.	H. I.	Elev.	Grade.	Cut.	Fill
t B. M.	4.65	104.65	100.00			
0	5.72		98.93			
1	13.88		90.77			
½+40	15.98		88.67			
		− 13.77				
t	2.21	90.88				
2	5.61		85.27			
½3	0.70		90.18			
		+ 12.69				
t	13.39	103.57				
4	10.14		93.43			
5	8.03		95.54			
½+80	7.58		95.99			

t	½
100.00	
4.65	15.98
2.21	0.70
13.39	7.58
120.25	24.26
24.26	
95.99	

intermediate station directly from your H. I. and you have your elevation. Respectfully yours,

I. H. LEAVENWORTH, C. E.

ANCIENT SURVEYORS OF INDIANA.

WASHINGTON, D. C., April 10, 1881.

EDITOR ENGINEERING NEWS:

There seems to be much interest taken in the practice of surveying the public lands, as evidenced by the many State associations of county and licensed surveyors, and the fitness and qualifications of surveyors are, of course, a theme of discussion.

It may be of interest to your many readers to know what were the *classical qualifications* of deputy U. S. surveyors heretofore, as evidenced by the inclosed description of a section of the country on the Kankakee River, in Indiana, which refers to Township 33, N. Range, 3 West, 2d Meridian, Indiana.

The locality is now to be recognized as English Lake, Stark County, Indiana. T. S. S.

"GENERAL REMARKS.

"That the river Styx is a fabled stream and that it never existed except in the brain of antient poets and priests, is a proposition I am fully prepared to deny and disprove.

"That *Charon* never existed, never kept a ferry boat & landing. That the dreary regions of which antient poets speak & through which the souls of unberried carcasses, wandered for 100 years before his majesty of the frail bark would give them a passage, and that the Elysian Fields where the souls of the just reveled in never ending scenes of pleasure and delight are immaginary regions—is equally false.

"The Kankakee, is the Antient Ackildu & the English lake is the stygian pool at the head of which near the line between ranges 3 & 4 still remain the indubitable evidences of Charon's existence, of the identical spot, where he so often landed his boat & took on board the souls of the departed. But last & most of all as a precious relic of antiquity, which would make even an ordinary antiquarian leap in an extacy of joy, the very paddle of the old Gentleman is still in existence.

"The dreary regions from the mouth of Maskum's Creek to the head of English lake & particularly about the mouth of Yellow river, is the place where so many poor souls wandered up & down (*up* on the rod and down in the mud!) their hundred years! & in fact as the use of the magnetic needle was not known at that age of the world, I am not at all surprised at its taking a poor soul so long to get out without compass, chart, grog or tobacco. The Door prairie and other smaller ones about it I take to be what remains of the Elysian fields.

"What has become of its antient occupants and why the order of things has been changed both in the Elysian field and about the stygian pool, neither the present natives of Kankakee, nor the owners, premtioners & occupants of Door prairie could tell me. I leave this to be ferretted out by Hiscorical societies & future antiquarians, having myself done sufficient to render me immortal by finding the prototype of the long-lost styx, Charon's ferry boat & landing, &c., without telling where & what is become of the old gentleman.

"This township will require a good knowledge of the antient poet to understand it, every thing said by them respecting the nether regions & the abode of the wicked should be applied to it, & the whole will make a true description of it.

"Bad as most of the townships of any district are, this undoubtedly is the worst among them, the greater part of what lies N. W. of the river, though it was hard frozen when we were there is a lake of stagnant water mostly deep, & that part of it called river, for truly it is all such, is filled with Gray ash Birch, Maple, Willow, Bl. Alder & Rose briar bushes as thick as the hair on a dog's back, & as well matted as the wool on a negro's head.

"The largest timber is more than half of it dead or dying & falling on the awful mess below, & under through and all about the whole is water from 1 to 3 ft. deep, sending up a stink & the whole supplied with a goodly number of most execrable water animals imaginable. The very thought produces premonitory symtoms of ague."

"JERE SMITH, D. S."

[With the required certificate of correctness dated 27th day of January, 1835.]

NATIONAL ACADEMY OF SCIENCES.

WASHINGTON, April 19.—The opening session of the annual meeting of the National Academy of Sciences was held in All Souls' Church in this city to-day. Professor William B. Rodgers, of the Massachusetts Institute, presided. A large number of distinguished scientific men were present, among others Professors Marsh, Newcomb, Baird, Hall and Hilgard. The morning session was devoted entirely to the transaction of private business.

At 1 p. m. the Academy held its second session, when the following papers were read: "On the Domain of Physiology," T. Sterry Hunt; "The Compass Plant of the Western Prairie," B. Alvord; "The Solar Constant," S. P. Langley; "The Color of the Sun," S. P. Langley; "On Mountain Observations," S. P. Langley; "On the Relations of Soils to Health," R. Pumpelly; "Reduction to Sea Level of Barometric Observations made at Elevated Stations," Elias Loomis.

THE PANAMA CANAL.

PROPOSED CHANGES IN THE TERMINI THAT ARE EXPECTED TO REDUCE THE LENGTH AND COST.

[Panama Star and Herald, April 6.]

Mr. Gaston Blanchet, representing Messrs. Convreux & Hersent, contractors for the building of the canal, leave to-day for New York. Mr. Blanchet has at present seventeen brigades in the field, and has secured reports covering the entire ground. The data secured make it certain that the estimates already made by his house are within reasonable limits. It would appear that distance can be saved and easier cutting secured by changing the terminal points on both sides of the Isthmus. The mouth of the Mindi River is now approved as the entrance on the Atlantic, and the Rio Grande entrance on this side will, it it said, be abandoned for the small bay on the north side of the city, where the Panama Railroad wharf is situated. This will reduce by one-half the submarine excavation required, while the formation through which the land-work will pass is much softer than that along the banks of the Rio Grande. Exhaustive surveys have definitely fixed these two particulars. On the Atlantic side a saving in distance of some seven kilometers is effected by the change proposed there, work which would have to be made through a swamp and under water, and would be exceedingly expensive. The Geological Bureau reports a greater and more uniform depth of earth along the entire line than had been discovered in previous surveys. An immense amount of work has been done, and the field notes are now so thoroughly worked up that working plans, etc., can be arranged and everything prepared for work before the machinery is ready. A central depot will be established at Gatun and the mouth of the river Chagres deepened to allow the passage of vessels of ordinary draft to that point. Houses have arrived from New Orleans and New York, and will be erected on the line for the use of employés.

Mr. Louis Verbrugghe, of the canal company, is now visiting the State of Bolivar in search of laborers for the canal.

WORKING ON THE PANAMA CANAL.

[From the London Times.]

A private letter from Colon, dated the 8th of March, just received at Liverpool, makes the following reference to the present position of M. de Lesseps canal across the Isthmus of Panama: "There are in the field to-day seventy-three civil engineers, clerks, etc. They are engaged in making a 'complementary survey'—that is, verifying last year's survey, and in endeavoring to make it better. They have 400 laborers, and will take 200 more. They have divided the distance into four-mile surveying camps, and apparently are thoroughly organized. Their great obstacle is the Chagres River. They propose to do away with it entirely by building a dam at a point where, at and between Mount Gamboa and another, it strikes the proposed line of the canal. This dam will be a most stupendous affair, perhaps the largest ever built, if, indeed, they succe d in building it. They have already sunk a shaft 100 feet deep at the point where they propose to build the dam and have not found bed rock, which they must do before the dam is commenced. This fact is giving them great anxiety. The dimensions of the proposed dam are: Length, 1,800 yards; height, 50 yards; thickness at bottom, 1,040 yards; and thickness at top, 260 yards. By building this dam they will (or they propose to) create a lake capable of holding 1,000,000,000 tons of water, which will have an overflow to the Pacific.

"Their present estimate is this: Canal to be completed in six years, working 8,000 men. The canal can be made at this point—viz.: Colon to Panama—and will be, if it is built anywhere in this region, for the Nicaraguan route is not practicable. But whoever builds it must have money. This M. de Lesseps has not. He has only promises and diplomacy."

MEXICAN INTELLIGENCE.

CITY OF MEXICO, April 15.—General Grant was received on his arrival by a number of distinguished citizens and called upon at once at his hotel by the Foreign Minister, Señor Mariscal. Mr. Romero, who came with him, has gone to Oajaca to consult with the local authorities there as to the new company for constructing a line from Anton Lizardo to the Pacific.

MEXICO CITY, March 29.—The railroad fever grows by what it feeds on, for in addition to the "Palmer-Sullivan" and "Boston Central" interoceanic and international routes, the "Oaxaca Southern," the "Eads Ship-Railway" and several local or state railroad enterprises, two Boston companies are now applying for concessions to construct roads.

One project is to run a line through Sinaloa and Durango, some two hundred miles, and connect with the Boston Central (Symon contract) in the state of Durango. Its terminus is to be on the Gulf of California at Altata—the seaport of Culiacan, the capital of Sinaloa. This government is to grant certain privileges on condition that the company erect a light-house in the harbor of Altata.

The other scheme is a more important affair. Mr. A. K. Owen, who represents some Massachusetts capitalists, proposes building a railway and telegraph line, 500 miles in length, from Eagle Pass on the Rio Grande to Topolovampo Bay on the Pacific Ocean, about one hundred and eighty miles above Mazatlan. Mr. Owen says the bay of Topolovampo is larger and more commodious than that of New York. It is reported that Generals Grant and Butler are interested in this enterprise, that the survey has been completed, and application for a concession without subsidy will be made as soon as lawyers (now at work) have completed the necessary documents.

The Veracruzanos still entertain fears that Tampico and Anton Lizardo may become rival ports, and have sent a second deputation (now in this city) to urge the Federal Government to appropriate funds for the improvement of the harbor of Vera Cruz.

Mexico is undergoing a rapid transformation. In the incredibly short space of seven months $68,000,000 have been invested in railroad and mining enterprises by American capitalists,

Texans and Californians are purchasing sugar and coffee plantations, and each steamer brings some speculators.

The Spanish organs and some of the Mexican journals continue their warnings against this influx of Americans, and urge the administration to encourage European emigration.

The Government has decided to have the public lands surveyed.

Unfortunately, immediately after the conquest the Spanish sovereigns made such lavish grants of territory to nobles and military chiefs that there is not as much land to dispose of as Americans

generally imagine. The Mexican descendants of many old Spanish families own hundreds of leagues, not only in the interior but in the southern parts of the republic, and away up in the wilds of Chihuahua, Coahuila and other States. Americans who purchase lands in the country would do well to have titles thoroughly searched.

The last New York steamer brought out sixteen more civil engineers under the leadership of A. M. Wellington, of Cleveland, O., for the Palmer-Sullivan Company. They were at once sent out along the line between Toluca and Morelia.

THE MEXICAN CENTRAL RAILWAY.

We are indebted to Mr. Wm. Rotch, Purchasing Agent, for the following first report of President Nickerson, of the above railway company, addressed to the stockholders and dated April 4, at 87 Milk street, Boston:

The survey of your line was commenced at the City of Mexico, under Howard Schuyler, Chief Engineer, with a small force, the last of June, 1880. The work of grading and bridging across the Valley of Mexico occupied much time, owing to the great number of culverts and bridges to be built, made necessary by the system of irrigation; and this delay was also aggravated by the rainy season. Track-laying was commenced about Sept. 15, 1880.

The great revival of railroad-building in the United States made it difficult to secure competent engineers and skilled workmen for Mexico; and the manufacturers of all kinds of rolling stock and machinery were so full of engagements that it was quite impossible to get our orders executed promptly.

The facilities for handling our supplies at Vera Cruz were inadequate; and our vessels were delayed a long time in discharging their cargoes, some of them nearly three months.

The want of knowledge of the language on the part of our engineers and workmen, the lack of experience in railroad work on the part of the laborers of the country, and many other difficulties, have seriously delayed the progress of our work.

On Sept. 15, Rudolph Fink, Esq., was elected General Manager, and he reached his field of labor about the middle of October, 1880.

According to the latest accounts, the grading is substantially completed for fifty-five miles, and forty miles of track have been laid. It is expected that the construction of the road will be completed about April 15 to Tula (fifty miles), and business opened at that city May 1.

In November the Mexican Government gave the company authority to commence construction at Paso del Norte, and immediate steps were taken for work at that point. Hon. George T. Anthony was elected General Superintendent of the Chihuahua Division, and has already organized a force of engineers, and made a preliminary survey, which shows a very favorable section for rapid construction. There are now being shipped to New Orleans 5,000 tons of steel rails and their fastenings, and contracts are being made for other necessary materials. It is hoped that the Atchison, Topeka & Santa Fe system of roads will be completed to El Paso in May; and we expect to have a section of our line graded and ready to commence laying track in June.

Engineers are at work locating our line from the Gulf of Mexico at Tampico to the Pacific, via the city of San Luis. There has been ordered to Tampico 2,000 tons of steel rails with their fastenings, and it is expected to commence construction on that section at an early date. A force of engineers, under C. A. Sweet, Esq., chief of the party, are in the field making a reconnoissance between Laredo and our main line near Durango, after which the party will explore the country between Laredo and Camargo, and a point south upon the Gulf line in the State of San Luis Potosi.

The government of Mexico has carried out faithfully the provisions of the concession, and treated the company with great fairness; and our relations with the Government and the people of Mexico are harmonious.

The absence of the General Solicitor in Mexico has delayed the completion of a report which is now being prepared, and which will contain all important legal documents, and a history of the enterprise to date. This report will be mailed to the stockholders at an early date.

The following is a list of the directors and officers:

Directors—Thomas Dana, William Rotch, Lucius G. Pratt, Warren Sawyer, Royal M. Pulsifer, Wm. O. Taylor, Theodore Nickerson, Levi C. Wade, George B. Wilbur, Benj. P. Cheney, Isaac T. Burr, Thomas Nickerson, of Boston; Robert R. Symon, Charles Lanier, Edward D. Adams, of New York; S. A. Kent, of Chicago; Walter W. Symon, Sabastian Camacho, Ramon G. Guzman, B. F. Beriozabal, F. Anza, of Mexico.

Executive Committee—Thos. Nickerson, Thos. Dana, William Rotch, Lucius G. Pratt, Warren Sawyer, Royal M. Pulsifer, William O. Taylor, Theodore Nickerson, Levi C. Wade, George B. Wilbur.

Officers—Thomas Nickerson, President; Robert R. Symon, Vice-President; Levi C. Wade, Second Vice-President; S. W. Reynolds, Clerk and Treasurer; Levi C. Wade, General Solicitor.

ENGINEERING IN FOREIGN COUNTRIES.

The French government has authorized an engineer to make a report on the possibility of constructing an underground railroad in Paris. The principal technical difficulty consists in the length of the tunnels and the necessity of employing non-smoking engines, etc.

Col. Flatters, who, the cable informs us, has been massacred, with the members of his expedition, had been sent out to survey the Trans-Sahara line.

FIRST ANNUAL CONVENTION OF THE AMERICAN WATER-WORKS ASSOCIATION.

[*Concluded from page* 159.]

WEDNESDAY, MARCH 30.

Evening session. The hour for opening having arrived, there was no quorum present, but by 8.45 quite a number had put in an appearance, and Vice-President Smith called the Association to order.

On motion, the reading of the journal was dispensed with. At this moment President Foster came in, and, after tendering an apology, took the chair.

The first topic for discussion being fuel required to raise 1,000,000 gallons 1 foot, was, in the opinion of many of the members, too formidable a one for present discussion. Mr. Holly was of the opinion that it would take fifteen days to clear up the list, and suggested that the topics of meters, motors and waste be taken up.

Mr. Briggs moved that a committee of two be appointed to draft a form of record for water-works, so as to insure some uniformity for comparisons, and give the members of the Association a better opportunity to discuss these topics from about the same standpoint. Upon the motion being put, it was carried, and Ira A. Holly and J. G. Briggs appointed.

Mr. Briggs declined to serve, and suggested the President in his stead. The Secretary objected on the ground that both the gentlemen named represented the same system, viz: "Direct Pumping," and was of the opinion that the "Reservoir" system should be represented as well, claiming that if these forms were to be general and cover all the points of a water-supply and distribution, that they should be got up so as to meet the wants of all systems. After some further discussion from Professor Smith and others the Chair appointed Mr. H. D. Wood as the other member of the committee. Professor C. A. Smith stated, that there were present representatives of two "Fuel Saving Furnaces," and moved that they be requested to explain their devices, which motion was seconded and carried. Mr. Frank H. Pond, representing the "Jarvis Patent Furnace" was introduced, and proceeded at some length to explain the merits of his furnace, and stated that the furnace at the Collier White Lead Works was effecting a saving of 40 per cent. by the use of slack coal, where formerly lump coal had been used.

Mr. Holly desired to know what rate of evaporation had been attained from slack. This Mr. Pond was unable to answer, stating that as yet he had not made any test, but expected to within a short time.

Prof. Smith desired to know the cost of the furnace. Mr. Pond replied that they charged one hundred and fifty dollars ($150) royalty, and that the cost of setting the same would not vary materially from the ordinary setting.

Mr. Holly: What is the cost of resetting boilers with your furnace?

Mr. Pond replied that it depended entirely upon the cost of mason-work, but that it should not exceed fifty dollars ($50).

Mr. Cameron asked: Suppose you can get nothing but good coal, then what is your saving?

Mr. Pond replid from 10 per cent. to 15 per cent.

Mr. Holly asked what would be the saving where slack or cheap coal was now being used, and received the same reply. There being no further questions put to the gentleman he retired, and Mr. R. L. Walker, of Boston, Mass., patentee of "Walkers Twin Furnace," was introduced and claimed to have a "smoke consuming" furnace. He presented a number of circulars, and brought with him drawings showing the full modus operandi of his furnace, and fully explained its workings, stating that he had evaporated as high as thirteen pounds of water per pound of combustible, by actual test.

President Foster asked how many pounds of water he could evaporate per pound of anthracite coal.

Mr. Walker replied that they had by actual test shown an evaporation of 10 1/5 with feed water at 76°. In reply to a question as to how much of a saving he would be willing to guarantee for the furnace, he stated that the furnace would show a saving of 33 per cent. to 40 per cent. of fuel, and would guarantee a saving of 25 per cent. or ask no royalty.

Prof. Smith took issue with the gentleman on some of the statements made, with reference to the amount of air required to support combustion and the proper mode of admitting it to the furnace (Mr. Walker having made the statement that the air should be admitted over the grate), the Professor stating that in considering the subject, this must be borne in mind, that it was one thing to burn fuel in a furnace and another to get the heat into the water, and that he had found it made no difference whether the air was admitted above or below the grate, so that "it did not come in chunks," and a proper amount was admitted to support combustion. He had frequently, he said, worked the furnaces at the University with the doors partly open. The main part in the admission of air to a furnace was to have it evenly and uniformly distributed. The great trouble, he stated, with Western furnaces was too much grate area and too thin fires, which admitted too much air, and too small combustion chamber. His experience was, that the grate area could not be made too small nor the combustion chamber too large, while just the opposite was easily done. Mr. Stripe presented some data as to results obtained at his works, stating that he was using 38 pounds of coal to raise 1,000,000 gallons one foot high, and was satisfied that it was entirely too much fuel, and, being desirous of knowing how or where to economize, wished the discussion confined entirely to this topic. He felt confident that it was costing his company entirely too much, and he wished to have a comparison made with what others were doing.

The President stated that the locality would, in a great measure, govern the cost of fuel for a million gallons, as the prices of coal varied with the locality.

Prof. Smith stated that so many items of engine duty were to be considered (evaporation, pump waste, etc.), that it would be utterly impossible to consider the matter fully at the present session.

The President suggested that it would be better to defer the matter until the next meeting.

Mr. Cameron agreed, and said it would be well to take Mr. Stripes' data as a basis. Some further discussion ensued on this topic, when the subject of cylinder oils was introduced and discussed by Messrs. Briggs, Holly and the Secretary, their experienced varying with the different oils used.

At 10.15 the Association, on motion, adjourned to meet at 9 o'clock a. m. Thursday.

THIRD DAY, THURSDAY, MARCH 31.

Association called to order at 10 o'clock a. m., President Foster in the chair. On motion of Prof. Smith, the reading of the journal was dispensed with. Prof. Smith asked for the opinion of the members as to the relative merits of wood and coal as a fuel; but none of the members present had had any experience in the use of wood.

Mr. Holly stated that he had tried corncobs as an experiment for two months, and his results showed that 3½ pounds of cobs were equal to one pound of coal (Illinois), cobs costing him forty cents per ton delivered.

The Secretary had used cobs for some time, but in conjunction with coal, and found them about 15 per cent. more expensive than coal alone, he paying at about the rate of fifty cents per ton.

On the subject of crude oil as a fuel, none of the members present had had any experience. Prof. Smith advanced the opinion that it could not possibly pay as a fuel, and President Foster coincided. The subject of gas was introduced, not as a fuel but as a motive power with a gas-engine, Prof. Smith stating that a friend of his was about constructing

a water-works in Texas, and proposed using a gas-engine as a motor.

Mr. Watts said he had experimented with gas-engines and tested the subject thoroughly, and was satisfied that for small works, or where a power not to exceed 12 to 15-horse was required, that it was the cheapest motor known, the chief expense, that of an engineer, and the boiler and its attendant repairs, is done away with; there is no consumption of fuel except when actually at work, then consumed precisely as the power was developed. In reply to a question as to whether it would pay to manufacture gas for an engine alone, he stated it would not, and that a gas-engine could only be utilized where there was an established gas supply. As a proof of the economy he stated that a tobacco factory in the city is using two elevators, doing an equal amount of work each, one run by a water motor, the other by a gas-engine, and the latter had proved to be much the cheaper.

Coal was the next subject. Mr. Holly stated that at Burlington he had tried several kinds, the best he had used being mined in the vicinity of Peoria, Ill., but that lately he had discontinued the use of good coal and was using slack. President Foster had tried slack, but found no advantage in it, as it cost him about $3.20 per ton, while lump coal (Indiana block) cost but $4.

Mr. Whitman stated that the St. Louis Works was at present using only Illinois coal. In comparison with anthracite the advantage is about one cent per bushel. From experiments made comparing the Big Muddy coal with Pittsburgh, it showed about 67 per cent; Pittsburgh being 100. In a test he had made in the East, with Pittsburgh and anthracite, the results were about equal. Depth of mains was next taken up, and the members generally expressed the view that that matter would be decided entirely by the locality of the works; for in the city of New Orleans, a depth of 18 inches would be sufficient, while in Minneapolis, Minn., they had a main 8 feet deep where they were compelled to keep the water running to prevent the main freezing.

Mr. Watts suggested that the members state the depth of mains of their respective companies, and the following reported:

Mr. Cameron, Memphis, Tenn.	2½ feet
Mr. Stripe, Keokuk, Ia.	5 "
Mr Quigley, Atchison, Kan.	4 "
Mr. Ratekin, Jacksonville, Ill.	4 "
Mr. Belcke, Peoria, Ill.	4 "
Mr. Whitman, St. Louis.	4½ "

President Foster stated that the main idea was to lay the mains sufficiently deep to prevent freezing, and to protect them from extreme summer heat, and cited a case at Chicago where water was delivered eight miles from the lake and showed a temperature two degrees lower than at the lake.

IRON, WOOD AND CEMENT MAINS.

A short running debate was held on this subject, and the evidence was unanimous in favor of cast-iron mains for general service. The objection to wood or cement mains was the difficulty of making a tap without causing leakage.

SERVICE PIPES.

On this subject quite a lengthy discussion ensued, Mr. Cameron introducing a resolution that it was the sense of the Association that the water companies should have exclusive control of the service pipes, and make reasonable charges therefor. The resolution called forth a spirited debate, Prof. Smith and others opposing on the ground that it was strictly a private affair of the different companies. Some companies were now doing just what the resolution called for, while others were leaving the matter of service pipes entirely to the plumbers, and still others were laying services to the curbstone free of charge. On putting the question it was lost, and at the request of the mover he was allowed to take the resolution from the table. On the relative merits of materials for services, Mr. Whitman stated that the city of Boston had thoroughly tested galvanized and enamelled wrought-iron and lead, and had proved lead pipe to be the best in all particulars. Mr. Holly quoted a case of lead poisoning and the causes thereof, which clearly proved that the case was due to negligence in not washing out the pipes. He (Mr. Holly) used enamelled wrought-iron exclusively.

Mr. Holman raised the question of laying services on unfinished streets and considered it bad policy.

The President stated that it had been done at South Park, Chicago, and that they had to be taken up and relaid.

Mr. Whitman instanced the laying of a four-inch pipe under the sidewalks to avoid unfinished streets, and cited one case where it had proved an unwise experiment. Mr. Cameron asked for a call of the roll to ascertain how many companies represented here charged for services, which was granted, and the following shown: Keokuk, Ia.; Peoria, Ill.; Jacksonville, Ill.; St. Louis, Mo.; Chicago, Ill.; Atchison, Kan., and Memphis, Tenn., while Burlington, Ia., and Hannibal, Mo., laid them to the curb line free of charge.

RATES, METERS AND MOTORS.

President Foster stated in reference to motors, that he allowed none to be used, as the capacity of his works was too limited.

Mr. Cameron advanced the statement that no consumer could use a motor if the water company charged anything like rates for the water used, as they were fearful water wasters.

Mr. Stripe, being desirous of retiring for awhile, asked leave to offer a resolution of thanks, which was granted, and the following resolution was offered and unanimously adopted:

"*Resolved*, That this Convention hereby tender its thanks to Prof. Charles A. Smith and other officers of the Washington University for their kindness in tendering the use of this hall and other rooms for the meeting of the Convention."

Mr. Whitman presented, and desired to have read, a letter from Geo. H. Frost, Esq., proprietor ENGINEERING NEWS, requesting the Convention to furnish official proceedings for publication, and moved the Secretary be instructed to furnish the same. Unanimously carried.

Mr. Cameron presented the following, and moved its adoption:

"*Resolved*, That a vote of thanks is hereby tendered to Messrs. J. W. Harrison, Ripley and Kimball and other merchants of the city, for courtesies extended to this Convention, especially for the very pleasant drive to the water-works. Also to Mr. Whitman, Superintendent of the Water-works, for his attentions."

Carried unanimously.

WATER METERS.

Mr. Whitman was called upon for his views and said they (St. Louis) had a large number of meters in use, chiefly the "Worthington," but had a number of "Crown" and "Union" meters, all of which were giving satisfaction. President Foster stated that he was using the Worthington exclusively and they were giving fine service.

Mr. Whitman said he had always found the Worthington meter just to the consumer; it had been in use thirty years and had always given satisfaction. Out of 400 meters in use in 1879, they only had 100 repair items, and they were mostly of a trifling character.

WASTE.

This most important subject was opened by Mr. Holly, who stated that about a year ago his waste became excessive, and in making examinations to find the cause, located it principally in water closets. After stopping them, or shutting off the water, his "leakage" was reduced about 190,000 gallons per day.

Mr. Whitman stated that no one consideration of water supply required as much attention as that of waste, and none was so hard to control. At his own works, at no hour of the twenty-four, does the quantity of water drawn from the mains fall below 52 per cent. of the rate at midday, and some times the minimum of the day's consumption is over 70 per cent. of the maximum. What then becomes of this immense quantity of water? But one answer can be given: that it is running away through pipes left carelessly or wilfully open, and found to be mainly in water closets, in which it was the practice to leave the water running continually.

He said that whenever there is a smell about the house people think they can stop it by letting the water run. In 1872 the water supply became very short, and observations were made of the amount pumped and the amount remaining in the reservoir. It was discovered that an immense amount of water was used or wasted between the hours of 10 p. m. and 6 a. m. On Dec. 10, 1878, they commenced making hourly measurements, which have been kept up ever since, and the profiles show that between 1 a. m. and 3 a. m. a very large amount of water was used which could not possibly have gone to legitimate uses, and the inference was, an immense waste. Accordingly, the Board of Public Improvements had drafted the following ordinance, and submitted it with the subjoined letter to the Mayor:

LETTER AND PROPOSED ORDINANCE REFERRED TO IN THE FOREGOING REPORT.

OFFICE OF THE PRESIDENT OF THE BOARD OF PUBLIC IMPROVEMENTS, ST. LOUIS, November 5, 1879.

Hon. Henry Overstols, Mayor:

SIR: The Board of Public Improvements, in fulfillment of the promise contained in its last annual report, herewith submits for your consideration, and for transmission to the Municipal Assembly, should you deem it expedient, the draft of "An ordinance to secure a more equal distribution and to lessen the waste of water." In doing so the Board desires to call your attention to the facts which, in its judgment, make such legislation a matter of the first importance.

The purpose of the city in building and operating the water-works was to furnish to its citizens a supply of water for their actual daily needs, and the rates for dwellings were fixed with a view to charging each water-taker a nominal price for the quantity of water which it was supposed he would really require; and it is a part of the contract contained in every water-license that no water shall be allowed to run except when it is actually needed.

Experience, however, has shown that this contract is violated in the most shameful manner, and to a degree which, without actual proof, would be incredible. But repeated measurements have established, beyond all controversy, that in the dead of night, when nearly the whole population is asleep, water is running to waste through the house service pipes at a rate which is from 60 to 80 per cent. of the rate of consumption at midday. In fact, over 50 per cent. of the water pumped out of the river runs back into the river without having been put to any use whatever. At present this waste is about fourteen millions of gallons per day, to pump which costs the city $140 per day, or $51,100 per year, for the single item of coal alone. But if, in addition, account be taken of the interest on the cost of the works, and the expenses of labor, superintendence and collection of revenue, the total cost will be found to be about six times this amount, or more than $300,000 per year.

This enormous waste of water is caused mainly by defective plumbing and by wilfully letting it run through water closets and hydrants.

That this explanation is adequate is proved by actual experiments which show that a single water-closet or hydrant left running, will, in twenty-four hours, discharge from 20,000 to 50,000 gallons of water, according to the pressure in the street mains. Taking the lowest figure, it needs only 700 taps, or one twenty-seventh of the total number, to be left open to account for the whole 14,000,000 gallons of water wasted.

The magnitude of the injustice, not to call it by any harder name, involved in this waste is seen in the fact that one open closet will in one year consume a quantity of water which has cost the city, for coal alone, seventy-three dollars, while the sum paid for it is only five dollars.

But the pecuniary wrong done the city is not the only one which is committed. Owing to the great differences of level which exist in this city, amounting, in some cases, to more than one hundred feet on a half mile of pipe, when water is allowed to escape on the low grounds, it very rapidly diminishes the pressure on the high grounds.

A few taps left open on a low level may destroy the pressure over a whole district on a higher level, and put its inhabitants to serious inconvenience.

Every man, therefore, particularly on low ground, who wilfully lets water run to waste robs not only the city, but his neighbors also, and is in a double sense a public-enemy.

In some other cities the evils which arise from a difference of elevation are cured by a distinct service for higher levels. But this always is an expensive remedy, and in St. Louis, owing to the great number of the hills, its cost would be so great as to put it wholly out of the question, and we must therefore get along as best we can with our present system of water distribution.

But in order to do this it is necessary, particularly on the low grounds, that no water be allowed to escape except as it is needed for actual use. In other words—to equalize the distribution, and to give to those on the upper levels of the city their fair share of water, the waste of water must be stopped on the lower levels. And without a large expenditure for additional distributing mains, this same necessity for economy would exist even if the capacity of the pumps were double what it is now.

Great as are the evils of water waste under any and all circumstances, they are multiplied many times by the fact that at the present rate of increase the consumption of water will very soon overtake the capacity of the pumps. The average daily consumption at the present time is about twenty-five million gallons—the minimum being twenty-two million and the maximum thirty-three and a half million. This last figure has, it is true, so far been reached only once—on the sixth day of January last—but there were nine days during that month when the average daily consumption was thirty-one and a half million.

The daily consumption has, for a number of years, been increasing at the rate of one and a half million gallons per year. Next year, therefore, we may expect an average daily consumption of twenty-six and a half million, and as a maximum thirty-three million to thirty-five million of gallons. But the utmost capacity of the present pumps for any length of time is thirty-three million, and even this cannot be relied on except when the smaller pumps are in perfect order. Within a year, therefore, we may, at the period of greatest consumption, expect a demand for water equal to or beyond the capacity of the present works to supply, and the moment this limit is passed a train of the most serious and alarming consequences will at once be set in operation. Of these the first will be the gradual depletion of the reservoir, and as it holds only 60,000,000 gallons, it will only require a draft of 3,000,000 gallons per day for twenty days to leave it entirely dry. While being depleted the water

will leave the high grounds and at the end of the process very large areas of the higher levels will be deprived of water—the whole supply having been consumed on the lower levels. At this time if a fire should occur in one of these higher districts there would be no means of arresting its progress, and a large portion of the city might thus be destroyed. It is, in fact, impossible to overstate the dangers which may threaten the city from a short supply of water; yet should the present reckless consumption of water be not checked, it will be only a short time before these dangers will be upon us.

Even if the city had the money to build additional water-works, which it has not, and owing to the constitutional limitation of the city debt, for many years will not have, it would be impossible to construct them in time to avert danger entirely. But if we can stop the waste we will probably for ten or twelve years be entirely safe, and by that time the ratio of the city's debt to the assessed valuation of property will, no doubt, be such that money for the extension of the water-works can be obtained without much difficulty. In the meantime, the surplus revenues of the city can be most profitably spent in extending the sewers and reconstructing the streets.

The sole object of the present bill is to check the present wholesale and wicked waste of water. The means by which it proposes to accomplish this are:

1. To leave the rates as now established precisely as they now exist, but to fix in each license an ample but definite limit of quantity, beyond which the water taker shall not go without becoming liable to additional payment.

2. To give the Water Commissioner, whenever there is reason to believe that this limit is passed, power to ascertain the fact by the use of a meter.

3. If a greater quantity has been used than that stated in the license, the Assessor and Collector of Water Rates is required to exact payment therefor before issuing another license. It is proposed, in a word, to make the contract between the city and water-taker more definite, and to provide specific means for its enforcement.

The basis on which the limit of quantity is determined is, first of all, to give to every water-taker, without regard to the amount paid, a quantity sufficient for every domestic or sanitary purpose. By the present proposed bill, this quantity is fixed at thirty cubic feet, which is equal to 225 gallons, or five and one-half barrels of water.

That this is ample for every purpose of cleanliness or health no one can question. In addition to this quantity every water-taker is allowed 100 cubic feet for every 15 cents of his license, or 100 gallons for every 2 cents, which is the ordinary meter rate to manufacturers. The whole amount per day which this will give for each license is shown by the following table:

TOTAL AND AVERAGE DAILY AMOUNT OF WATER WHICH MAY BE CONSUMED UNDER LICENSE COSTING FROM $2.50 TO $15 FOR SIX MONTHS.

License for Six Months	Total quantity. Cubic feet.	No. galls.	Ave. daily quantity. C. feet.	No. galls.	Bbls.
$2.50.....	7,142	53,422	39	293	7¼
4.00.....	8,142	60,902	45	334	8⅓
5.00.....	8,808	65,883	48	362	9
6.00.....	9,475	70,873	52	390	9¾
7.50.....	10,475	74,853	57	430	10¾
9.00.....	11,475	85,833	63	470	11¾
10.00.....	12,142	90,822	67	500	12½
12.00.....	13,475	100,793	74	550	13¾
15.00.....	15,475	115,753	85	635	16

An inspection of this table will show that the quantity allowed is in every case as large as can, under ordinary circumstances, be required, and is certainly as much as the city can afford to furnish for the money.

If, however, any one desires to use more, or lets the water in his hydrant or water-closet run constantly, he becomes liable to pay for it at the very low rate of 15 cents for every 100 cubic feet. But after paying one such bill it is not likely that he will ever pay a second, and the practical result will be that the greater part of the waste will be stopped, and the city will thus be enabled, with the present works, to meet all demands for many years. And as the rates are to be left just as at present, all this will be accomplished without any loss of revenue.

For unless it can be shown that some who now take water will not take it under the proposed bill, the only change it can possibly make in the revenue will be to increase it.

The Board is further of the opinion that the waste of water cannot be effectually prevented in any other way. The only other means possible to effect it is to employ a large force of detectives to enter houses, and, by inspection, to ascertain whether or not water is being wasted. This system, besides being very expensive, and at the same time very irritating to householders, can only reach one cause of the trouble. With a vigorous administration it may discover, and to a large extent cure, defective plumbing, but as against wilful waste, which is the great evil, it is wholly powerless. For, even if the inspector finds the water running, it is in most cases impossible to inflict any penalty because of the impossibility of proving that at that particular moment the water was not being used; or the water may be stopped at the time of the inspector's visit, but turned on again as soon as he is out of the house.

The only detective worth anything against wilful waste of water is a meter which is always on the ground, and which tells a story that cannot be gainsaid.

In conclusion, therefore, the board very strongly recommends the enactment of the ordinance herewith submitted, because the plan it proposes is, under all circumstances, the most just and reasonable, and also because it is, in its judgment, the only plan which can effectually ward off the rapidly approaching and terrible evil of an inadequate supply of water.

By order of the Board. THOS. J. WHITMAN,
President pro tem.

AN ORDINANCE TO SECURE A MORE EQUAL DISTRIBUTION AND TO LESSEN THE WASTE OF WATER.

Be it ordained by the Municipal Assembly of the City of St. Louis as follows:

SECTION 1. All licenses for the right to use water, other than licenses issued to manufacturers and other large consumers of water under meter rates, shall state: First. The premises on and purposes for which the water is to be used. Second. The amount paid for said license. Third. The total and average daily quantity of water the water-taker is entitled to use without additional payment. Fourth. Such other information as may be deemed requisite by the Assessor and Collector of Water Rates.

SEC. 2. Any party holding a water-license may use a greater quantity than the total quantity stated in the license during the specified time, provided that at the expiration of the license said party shall pay to the Assessor and Collector of Water Rates 15 cents for each 100 cubic feet of water used in excess of the total quantity stated in the license.

SEC. 3. Any party holding a water-license who shall use water in excess of the quantity stated in his license, and fail or refuse to pay for such excess in accordance with Section 2 of this ordinance, shall be considered as delinquent in the payment of water taxes. The Assessor and Collector of Water Rates shall refuse to issue to said party any new license until said payment has been made.

SEC. 4. The total quantity of water stated in the license, and which the holder thereof is entitled to use without extra payment within the time specified, shall be determined by allowing 100 cubic feet of water for each 15 cents of the amount paid for said license, and an additional 30 cubic feet of water for each and every day during the time for which the license has been issued.

SEC. 5. Should the Assessor and Collector of Water Rates have reason to believe that the quantity of water consumed on any premises is in excess of the quantity stated in the license for said premises, he shall notify the Water Commissioner, who shall thereupon place a meter upon the pipe supplying said premises; or the Water Commissioner may of his own motion place a meter on any supply pipe whenever he shall have reason to believe that the amount of water passed through said pipe is greater than the quantity stated in the license, but in every such case the Water Commissioner shall immediately notify the Assessor and Collector of Water Rates in writing of the placing of said meter. Within twenty days after the placing of a meter under the provisions of this ordinance, the Assessor and Collector of Water Rates shall cause said meter to be read, and shall notify the water-taker of the average quantity of water which has been used per day. If a meter be placed on any premises during the term for which the license has been issued, the settlement at the expiration of the license shall be made under the presumption that from the date of the issue of the license to the date when the meter was placed, the daily consumption of water had been the average daily quantity stated in the license, but from the date of the placing of the meter the quantity used shall be taken and held to be that shown by the meter as read under the direction of the Assessor and Collector of Water Rates.

SEC. 6. All meters placed under the provisions of this ordinance shall be paid for by the city out of water-works revenue, and all work of placing, repairing and keeping said meters in order, shall be done under the control of the Water Commissioner.

SEC. 7. If any water-taker should remove from the premises for which his license was issued, before the expiration of the same, he shall notify the Assessor and Collector of Water Rates of such removal. The latter shall then cause the meter at said premises to be read. If the water-taker is found to have used an average quantity of water less than that stated in his license, he shall be entitled to a credit on a subsequent license, which credit shall be in the proportion that the unexpired term of his license bears to the full term for which the license was issued. If the average daily quantity is found to be in excess of that stated in his license, the water-taker shall receive a credit which shall be in the proportion that the total quantity of water not used bears to the total quantity of water stated in the license. If the total quantity of water used is found to exceed the total quantity stated in the license, no credit shall be given and no new license shall be issued to the water-taker until he has paid for the excess at the rate fixed by Section 2 of this ordinance. In case no meter has been placed on the premises in question, the credit given by the Assessor and Collector of Water Rates shall be in the proportion that the unexpired term of the license bears to the full term for which the license was issued. Any water-taker, deprived of the use of water in consequence of the destruction by fire of the premises for which the license was issued, shall be entitled to have a transfer made under the provisions of this section.

SEC. 8. The Assessor and Collector of Water Rates is hereby authorized to shut off the water from all premises and hydrants for the non-payment of license, or for the non-payment for water used under provision of Section 3 of this ordinance.

SEC. 9. Whenever the Assessor and Collector of Water Rates shall cause the water to be shut off from any premises or hydrant, and it shall be let on again without permission of said Assessor and Collector of Water Rates, he shall notify the Water Commissioner, who shall immediately cause the connection with the main pipe to be cut off. Any person procuring water from a hydrant or pipe that has been shut off by said Assessor and Collector shall be deemed guilty of a misdemeanor, and, upon conviction thereof, shall be fined not less than five dollars nor more than fifty dollars.

SEC. 10. For any violation of the provisions of this ordinance, for which a special penalty is not hereinbefore provided, the offender shall be deemed guilty of a misdemeanor, and, upon conviction thereof, be fined not less than three dollars nor more than one hundred dollars, to be recovered before the Police Justice as in other cases of violation of ordinance.

SEC. 11. In order to carry out the provisions of this ordinance, the Board of Public Improvements is hereby authorized and directed to advertise for proposals for furnishing one thousand meters. Said proposals to be made upon the understanding (which is to be expressed in the contract) that by paying for one thousand meters, the city of St. Louis shall acquire the right to manufacture for its own use meters of the same design, up to and including one inch aperture, without any further payment. The Board shall make examinations and tests of the meters offered, comparing them on the several points hereinafter mentioned, and shall grade them in accordance with their relative merits up to the numbers given under each head, to-wit: First. Cheapness of price; the highest grade number to be seventy-five. Second. The nature of the material of which the meter is composed, which shall not be liable to injurious corrosion: the highest grade number to be seventy-five. Third. Simplicity of construction, and non-liability to get out of order; the highest grade number to be one hundred and twenty-five. No meter shall be considered where the error of registration, under ordinary conditions of supply opening, exceeds ten per cent., and the error must be in favor of the water-taker. The Board of Public Improvement shall award the contract to the bidder whose meter has received the highest total of grade numbers, or may reject all bids. The contract to be subject to the approval of the Council.

SEC. 12. The sum of ten thousand dollars is hereby appropriated and set apart out of the water-works revenue for the purpose of paying for such meters as may be procured under authority of this ordinance.

SEC. 13. All ordinances or parts of ordinances that are in conflict with this ordinance are hereby repealed.

The feeling Mr. Whitman said was very much against the ordinance, some people declaring they would not have a meter in their house. As an instance of what might be saved by placing a meter, Mr. Whitman cited a case where a year ago a meter was put into a house where the tax allowed a consumption of 400 gallons per day. It was found by meter registration that 2,800 gallons were being used. The resident's orders were then to allow matters to go as they had been, and no more care than ordinary be taken in the use of water; the same consumption and waste were recorded. Then care was ordered in the use of water and no waste allowed, but no obvious stinting where the water was required, and the result was, that but little more than 400 gallons per day were registered. He stated that it cost the city fully $300,000 annually in fuel alone to simply supply the waste. Another great source of waste is the freezing and bursting of pipes, and if some means were devised to drain all pipes, and the consumer be compelled to do it, a large saving might be effected, and it would lighten the duties of the water inspector as well.

Mr. Whitman stated that one objection to the general use of water meters was, that many persons might, through fear of penalty, limit the use of water so that their premises would not be kept in cleanliness, and thus commit an offense against the public health. The rate per capita was from 110 to 115 gallons per diem, yet Bail's tables show in some instances where, in families of ten to twelve persons, the use of water has not exceeded 4⅝ to 4½ gallons each. Such a state of affairs would save the water, but would breed disease and alarmingly increase the doctor's bill.

Mr. Watts thought the greatest objection to the use of meters would be their expense, that to supply the 137,000 taps of St. Louis would cost $500,000.

Prof. Smith stated that it was not proposed to put in meters everywhere, nor was it necessary. The moral effect of 2,000 meters would be as great as 40,000, and these would not cost any $500,000. Col. R. H. Hunt was allowed to show U. S. Engineer Farney's patent water monitor or regulator, which is perfectly automatic in action, and which, in the opinion of Mr. Whitman and others, will solve the question of water waste, provided it will stand all the tests.

The hour being past noon some of the members were anxious for an adjournment. Mr. Holly moved the session be continued to the close without adjourning. Carried.

On motion of Mr. Holly the remaining topics, as reported by the Committee, as well as that of "Duty" be referred to committees, to be appointed by the President or the Executive Committee, and be presented at the next annual meeting.

The claim of W. C. Stripe for printing, postage, etc., incidental to the call of this meeting, amounting to $19.25, read and on motion ordered paid.

On motion the Secretary was instructed to have proceedings of this convention published and distributed to all water companies in the United States. On motion adjourned to meet at Columbus, O., the second Thursday in March, 1882.

J. H. DECKER, Secretary.

NOTES.

RAISING AN IRON-CLAD.

One of the most notable late achievements in engineering has been the re floating of the French iron-clad Richelieu in the harbor of Toulon. It will be remembered that about the last of December, 1880, she took fire and was scuttled. She was brought to the surface again by relieving her of all removable weighty attachments, by sealing all openings, and by pumping down air to displace the water in the compartments while the water was pumped out. About 360 barrels, each containing 1,000 liters of air, were also employed.

AN ILLUMINATING MATERIAL.

A new illuminating stuff, the intensity of which can be increased to that of the best gas, has been exhibtited by the Russian, Mr. V. Kordig, before the Polytechnical Society of Berlin, Prussia. The stuff consists of mixture of naptha and a stuff, the nature of which is kept secret by the discoverer, which is flavored with cinnamon oil. The chief advantage of this new illuminating stuff consists, according to report, in the entire absence of all danger of explosion. Mr. V. Kordig sprinkled his coat with the material, lighted it and appeared as a living fire-column whithout harm to himself, or his clothes suffering the least damage. With the same entire impunity tried the experiment before several members of the society. One pound of this illuminating stuff cost, at the time, 7½ cents. It is well known that the ancient oriental nations, the Arabs, Persians, Abyssinians, Hebrews, etc., made use of the natural naptha, found at the foot of the Himmalaya Mountains, the cradle of the human race.

LONGITUDE OF THE ASIATIC COAST.

It is understood that Lieut. Commanders F. M. Green and C. H. Davis, Lieuts. S. M. Ackley and John Morris and Surgeon Dale, United States Navy, now in San Francisco, have been detailed by the Navy Department to determine the correct longitude of the Asiatic coast of the Pacific Ocean. They sail for China, to join the Palos on the Asiatic Station. All points on the coast of Japan and China connected by cable will be visited, and their exact longitude determined. The American officers have permission from the cable companies to establish stations and use the wires at night. English officers are now engaged in a similar work in New Zealand and Australia. The information obtained by the observations will be exchanged by the two nations. English officers have determined the longitude as far as Madras, and Russian officers have made observations on the Siberian coast. All observations have been taken from the Hong Kong Observatory. The American party will ascertain the precise longitude of that place, there being a question as to the accuracy of the standard. The object of this movement by the Navy Department is to establish correct standards, from which true charts for the protection of maritime interests may be produced.

SEWAGE AND RULES FOR PUBLIC BUILDINGS IN ENGLAND.

The following rules, to be observed in the construction of all buildings erected under Her Majesty's Office of Works, have been prepared and issued by the Secretary of the Office of Works. 1. All water closets and urinals shall be constucted so that one wall at least of such closets and urinals shall be an outer wall of the building. 2. All soil pipes shall be carried outside the building, and ventilated by means of pipes leading the foul gases above the highest point of the building. Such pipes to be carried to points removed from chimney stacks. 3. Separate cisterns shall be constructed for the water closets and for the general purposes of the building. No tap or "draw-off" shall be affixed to any pipe communicating with a cistern supplying a water closet or urinal. 4. All waste pipes and overflow pipes of cisterns shall terminate in the open air, and be cut off from all direct communication with drains. 5. Great attention shall be paid to insuring thorough ventilation in all rooms. Rooms so high that their ceilings shall be more than two feet above the top of the windows, corridors, staircases and other open spaces, shall be specially ventilated so as to prevent the accumulation of stagnant air. 6. All main drains should, where practicable, be formed outside the building. In the event of its being necessary to carry a main drain underneath a main wall, then a ventilating pipe must be carried from that point to the highest part of the roof, as under Rule 2.

LEAD PIPE.

The following extract from the London *Globe* may in part explain some of the facts which appear to make it impossible to secure good house drainage in New York, and may also contain valuable information for those who intend laying subterranean telegraph wires:

It is said that a rather important fact has been observed in connection with the telegraph systems of some parts of the Continent. The wires have in many parts been laid in leaden pipes buried beneath the roadways, and in some places imbedded in mortar or cement. Wherever this has been the case, it is reported that on opening the pipes the lead has been found to have disappeared, and to have given place to a basic carbonate of a brittle and porous nature. Experiments conducted by an expert have shown, it is said, that lead, when placed in contact with lime for a time, invariably loses in weight and becomes subject to a corrosive action which ultimately destroys it. A pipe made of lead one twenty-fifth of an inch in thickness and imbedded in lime mortar would, it was found, be eaten through in fifteen or sixteen months. This can hardly be an original observation, for it is incredible that such an effect should never have been observed till the Germans began to lay their telegraph wires underground, if the facts are as represented. It certainly is not so well known, however, as its importance requires that it should be, if lime either in mortar or cement really has this effect upon this metal. It seems very probable that the bursting of pipes during a frost may be greatly facilitated by the attenuating action of this kind of corrosion. There are still some houses in the building of which lime is employed for the mortar, and there are a great many in which lead pipes are imbedded in cement. It is well worth while to be aware of this source of mischief, especially as it seems very easy of remedy. If pipes passing through a wall were laid in plaster of Paris they would effectually be guarded against the operation of lime which might chance to be in their vicinity. It should, however, be understood that this applies to lead pipes that are really lead pipes. What would be the action either of lime or plaster of Paris on the "compo" pipes in such favor with jerry builders we cannot undertake to say.

GENERAL INTELLIGENCE.

☞ *We solicit and are always pleased to publish in these columns any items of interest that may be furnished us.*

GAS AND WATER.

The town of Winnepeg, Manitoba, has advertised for proposals for water-works in the Toronto *Globe*.

Paris has 4 steam fire-engines; New York, 57. At New York there are 3200 fire-plugs: at Paris there are 920, of which 600 have been established within the last year.

Akron, O., now lights its streets with 4 Brush lights on an iron mast, 208 feet high, supplemented by a similar cluster three-quarters of a mile distant on a high building.

The village improvement society of Hyde Park, MASS., will begin its work by planting trees, and will also examine the sanitary condition of the town, analyzing the water.

The Corporation of the village of Côte Saint Antoine, Quebec, will apply to the Quebec Legislature, at its next session, for an Act to amend Act 42-43 Vict., cap. 43, Quebec, and for further powers respecting the borrowing of money, establishment and maintenance of water-works and for other purposes.

The prudential committee of the fire district of Adams, Mass., will not eniarge the reservoir on the brook supplying the village with water, but talk of building another farther up the stream, as a storage reservoir, to hold about 6,000,000 gallons, as they find that it can be built at a comparatively small cost. The work will probably be undertaken this spring.

The capacity of the new Chapman four-valve hydrant, on the northeast corner of Court square, has been tested, and City Engineer Ellis reports these results: Pressure at the hydrant before starting, 120 pounds per minute to the square inch, with one 50-foot four-inch rubber-lined hose, with a 1⅝-inch nozzle; pressure at the main, 115 pounds, discharge about 420 gallons. With two lines open the pressure at the main was 110 pounds, and the discharge 816 gallons; with three lines open, the figures were 105 and 1,200; with four they were 100 and 1,560.—Springfield *Republican*.

The Board of Water-works trustees, of Springfield, O., on the 11th, opened bids on pumping and engine-house, former bids having been set aside. Bids were as follows:

John Kershner, building complete, roof No. 1 $11,623.80; roof No. 2, $11,201.80; roof No. 3, $10,873.80.

No name, building complete, $12,425, (supposed to be Stevens, Toledo).

Dawson & Anderson, Toledo, Ohio, building complete with roof No. 1, (iron), $14,825.

The lump bid of John Kershner is the lowest of the above, and the contract will probably be awarded him, but has not ben finally decided.

The trustees have elected E. C. Gwynn, of Springfield, to superintend pipe-laying.

ELECTRICITY.

The appeal taken by Prof. Thomas A. Edison in the interference case of Maxim against Edison has been decided against Edison's claim by the "Board of Examiners in Chief" of the patent office.

The Edison Electric Illuminating Company of New York, which has an authorized capital of $1,000,000 in shares of $100 each, and has obtained the right to lay wires in the streets of New York City, has authorized $750,000 of the stock to be offered for subscription at par to the stockholders of the Edison Electric Light Company in the proportion of two shares of the stock of the latter company for three shares of the stock of the illuminating company. No subscriptions can be received for fractional parts of a share. Payments will be required as follows: $5 per share at the time of subscription, $20 on allotment, $25 on June 1, 1881, and the remaining $50 to be called in on ten days' notice, as required, not earlier than $25 July 1 and $25 August 1, 1881. The transfer books for the purpose of this subscription will be closed from Saturday, April 30, at 2 p. m., to Wednesday, May 11, at 10 a. m.

The plan of the Brush Electric Illuminating Company for the lighting of Union and Madison squares, New York City, is similar to that on which the city of Wabash, Ind., is lighted. A hollow iron pole 150 feet high will be erected at a central point in each square. On the top of the pole there will be a group of six lights, each of 6,000 candle power, arranged on a triangular frame. Within the hollow standard will rise and fall a weight to balance the triangle so that it may be lowered easily for replenishing the carbons. The wires which supply the current will be led to the lamps from some tall neighboring building, and will be invisible at night.

It is proposed to place the group of lights in each square, so that they will shine up and down Broadway, as well as up and down one of the side streets. It is calculated that in Broadway, between the two squares, no other lights will be needed.

Secretary A. A. Hayes, Jr., says that all obstacles to the acceptance of the company's bids for the lighting contract are apparently removed by the franchise permitting the erection of poles and wires granted by the Common Council last Tuesday. Two bids were put in by the company—one for a large district and one for a small district, including Union and Madison squares. The bid for this smaller district, Mr. Hayes says, is less than the cost of gas last year for the same district.

STREETS, DRAINAGE, ETC.

New London, Conn., is to hold a special town meeting to decide whether to build new sewers or let things remain in their present unhealthy state.

Greenwich, Conn., which has recently introduced a public water supply, is discussing the subject of sewerage with a strong probability of the commencement of work thereon this season.

NEW ORLEANS, April 20.—The Mayor has approved the ordinance adopting the Memphis or "Waring" plan of pipe sewers and subsoil tile drains in New Orleans. The plan had been under discussion nine months, and was approved by the Board of Health, the Sanitary Association, and the principal engineers of the State.

The International Sanitary Conference, which sat in Washington recently, recommends an organized internal service in each country represented, the weekly publication of mortality statistics, regular communication between the various agencies, the establishment of two central agencies at Havana and Vienna, and the establishment of a scientific commission by the countries directly interested in protecting themselves against yellow fever.

JACKSONVILLE, FLA., April 18.—A. B. Linderman and a surveying party, who left here on the 7th inst. to explore the waters of Kissimmee River, Lake Okeechobee and Caloosahatchee River, to determine the practicability of draining the lake and everglades, reached Fort Myers on the Caloosahatchee yesterday. They telegraphed the *Union* that the General Meigs survey, determining the altitude of the lake as above the sea level and its fall into the Caloosahatchee, is more than confirmed. The party are all well.

The subject of sewerage is expected to receive considerable in Northampton, Mass., this season. The plans of engineer Shedd for a system of sew for the town of Northampton, as well as for Florence and Bay State are at the law office of Delano & Hammond, where all interested are invited to examine them. They are drawn on a scale of 200 feet to the inch. The committee are now making up their report.

The City Council of Wilkesbarre, Pa., in special session Tuesday evening, the 12th, considered the much-agitated sewer question. A number of prominent citizens were present by invitation. Among the number were Alexander Farnham, Esq., a leading lawyer and ex-District Attorney of the county, and Hon. Harry Hakes, who is both a physician and an attorney. Each of these made exhaustive speeches on sewers, their indorsements inclin-

ing strongly to the Waring system now in operation in Memphis, Tenn.; Lenox, Mass., and several English towns. The Council finally passed a resolution declaring distrust of their own ability to decide upon the best plan and referring the matter to a committee of five local engineers to report at as early a day as practicable.

BRIDGES.

The new railway bridge, 1,100 feet long, commenced at Woodstock, N. B., three months ago, is completed.

The Providence & Stonington railroad proposes to build a bridge across the Thames at New London, about a mile and a half above the present ferry, to shorten the running time of the road and increase its facilities for freight business.

At a meeting of County Commissioners, Springfield, Ohio, on the 14th, a petition for erection of a bridge across Rockway Creek, in German Township; also one for the erection of a bridge across Sinking Creek, were placed on file.

ELGIN, Ill., April 19.—A flood was caused by the breaking of a dam ten miles north of here, precipitating the swollen waters of Fox River on this city this afternoon. Two bridges and a dam were swept away. The damage is $100,000. Bridges and dams at Carpenterville, Dundee, South Elgin, St. Charles and Geneva, all in this county, were also swept away.

The counsel for the trustees of the East River bridge has given a formal opinion that the elevated railroad station in Chatham street, opposite the bridge approach, is an unlawful obstruction, and that the trustees have the power to remove it forthwith. The opinion sets forth that the map of the bridge, as laid out in 1869, shows the same approach as now built, and thus an absolute right to an unobstructed entrance was gained under the law incorporating the former Bridge Company. It is also held that the Elevated Railroad Company had no authority from the commission under which it was formed to erect a station where it was done in Chatham street. The opinion has been referred to the corporation counsel of the two cities for consideration.

Messrs. Clark, Reeves & Co. are having built, at the Phœnix Iron Works, Phœnixville, a 270-foot drawbridge for Morgan's Louisiana & Texas Railroad, at Berwick Bay. The structure will rest on wooden piles, which will be about 3 feet in diameter and 150 feet long. As it will be necessary to splice a long pile of wood, a wrought-iron sleeve has been made in halves, edged with heavy angle-iron and about 8 feet long, which will relieve the abutting ends of the piles and bind them securely together. The water at the point selected for the bridge is about 90 feet in depth, and the piles will be driven about 50 feet into the river bottom. For the draw-span alone there will be over 200 piles driven. This will be a huge undertaking, but this well-known bridge company is equal to the task.—*Reading Eagle.*

RAILROADS.

A New York company has purchased the East Alabama and Cincinnati Railroad, and contracts will at once be made to extend the road to Gadsden.

On the 20th the New York Assembly passed a bill for the appointment by the Governor and Senate of a board of three Commissioners to supervise the railroads of the State.

All the car-axles of the Philadelphia & Reading Railroad Company will be hereafter manufactured by Cofrode & Saylor, of the Philadelphia Bridge Works, Pottstown.

Ground was broken at Dallas, Tex., on the 18th, on the Chicago, Texas & Mexican Central Railroad. The first dirt was thrown by Daniel W. Hale, of Chicago, President of the company.

The directors of the Miami Valley & Columbus Railway met in Columbus, O., April 14, and confirmed the sale of bonds heretofore contracted for, sufficient to build the road thence to Waynesville, O. Work will be commenced as soon as the weather will allow.

At a special meeting of the Manhattan Directory, Mr. R. M. Galloway was elected President of the Board of Directors of the Manhattan Railway Company, in place of Mr. William R. Garrison, resigned. Mr Galloway has been since the beginning of the year Vice-President of the Board.

Clark, Post & Co., of New York, branch of E. W. Clark & Co., of Philadelphia, have purchased the Genesee Valley Canal Railroad, which runs from Rochester, N. Y., to Salamanca, for $128,000, and have pledged themselves to raise $7,000,000 to complete the road and connecting links.

Tracklaying began at Linesville, on the west end of the Meadville Railway, a few days ago, and work will be pushed forward as fast as the weather will permit. Thirteen hundred tons of steel rails are on hand, and the balance will be delivered during the present month. The road is 20 miles long, and will be finished by June 1.

A dispatch from Madison, Wis., says: "The Chicago & Northwestern Railroad Company contemplate building four branches and extensions in the northwestern portion of the State during the coming season. One is from a point on the Wisconsin River, in Crawford County, opposite Woodman, to Tomah, in Monroe County, there to connect with the Wisconsin Valley Railroad. This will be an extension of the Chicago & Tomah road, now built to Woodman, and, with a branch to the Viroqua extension, will be 100 miles long. Other branches projected are from Montford Junction of the Milwaukee & Madison Air line and the Chicago & Tomah north to Highland, eight miles, and another southeast to Linden, six miles. The fourth projected road is a branch from Dodgeville, on an air line in Iowa County, south to Mineral Point, nine miles, there to connect with the Mineral Point Railway."

Ex-Governor John Evans, of Colorado, President of the recently organized Denver & New Orleans Railroad, is staying at the Windsor hotel this week. Governor Evans stated that the company was organized about a month ago with a capital stock of $10,000,000, and that arrangements for the construction of the road were being pushed. Engineers were in the field, and when their surveys were reported contracts for building would be let. It was expected to connect the road with the railroads of Texas, which were now building up toward the proposed Denver & New Orleans road, which would almost make an air-line from Denver to Galveston, and over the Texas Pacific lines it would be a very direct line from Denver to New Orleans. In this way Denver would be about as near to Galveston as it is to St. Louis, and as near to New Orleans as to Chicago. The new road would connect the system of roads centering in Denver with all the roads of Texas and the South. It is expected that the railroad will be built next year, and Arkansas will probably be reached this year, where East and West connections will be made with the Atchison & Topeka Railroad. One hundred and fifty miles of steel rails have been already purchased. The Chief Engineer is H. C. Lowrie, present City Engineer of Denver, Colorado.

NEW PROJECTS.

A preliminary survey of a branch railroad from Bristol, Vt., to some point on the Rutland & Burlington Railroad will be made soon.

On last Monday the citizens of Lima, O., voted to build a new court-house, to cost $125,000. The necessary steps will at once be taken to put the work under contract.

NORRISTOWN, Pa., April 15.—It is proposed to build a railroad from Lancaster to New York. The portion from Lancaster to Phœnixville has been contracted to L. L. Bush.

GALVESTON, Tex., April 19.—The *News* has a dispatch from Fort Worth to the effect that several farmers of Tarrant County have filed an application with the Secretary of State for a charter incorporating a company to build a cotton factory to cost $100,000.

The Eastern Telegraph Company has organized at Augusta, Me., with $500,000 capital, and elected the following officers: President, F. Robie; Vice-President, Lewis Parker; Secretary and Treasurer, F. E. Richards; Directors, F. Robie, L. Parker, A. F. Crockett, Lewis Pierce, J. R. Bodwell, G. S. C. Dow, J. H. L. Cobb.

The Silver Cliff & Rosita Railway Company has filed articles of incorporation with the Secretary of State of Colorado. The capital stock is $150,000, divided into shares of $50 each. The directors are: W. I. Adams, F. H. Denman, F. E. Morse, D. D. Miller and A. B. Tuttle. The road will run from the terminus of the railroad at Silver Cliff to Rosita.

The books for subscriptions to the stock of the East River Bridge & Coney Island Steam Transit Company were opened on Saturday, 16th, at the National City Bank, Brooklyn, and in a very short time the necessary $1,000,000 was subscribed. Mr. Andrew B. Culver, of the Prospect Park & Coney Island Railroad, took 3,000 shares and deposited the necessary 5 per cent. with Mr. Daniel T. Walden, treasurer of the Commission.

An Indianapolis dispatch says: "Articles of association were filed April 14 with the Secretary of State incorporating the Indianapolis, Newcastle & Columbus (O.) Railroad, with a paid-up capital stock of $600,000. The survey is made and work will begin at once, and by the middle of July trains will be running over parts of the road. Among the stockholders are John Jacob Astor and Moses Taylor, the President of the C., B. & Q. road, and leading capitalists of New York and Boston."

The Chicago, Decorah & Minnesota Railway Company has filed its articles of incorporation in Decorah Ia. Authorized capital, $10,000,000. Among the incorporators are James H. Eastman, C. E. Dickerman, A. Bradish, J. M. Green and others, of Decorah; William Larabee, of Fayette County, and E. H. Williams of Clayton County. It contemplates building a railroad from Decorah to connect with the Burlington road at Pottsville and an extension of the same road northward from Decorah.

At the annual meeting of the stockholders of the Cincinnati, Wabash & Michigan Railroad in Wabash, Ind., April 13, the following Board of Directors was elected: H. B. Payne, J. H. Wade, William Bingham, C. P. Leland and W. S. Jones, all of Cleveland, O.; J. H. Defrees, Goshen; N. Beckley, Elkhart; C. Cowgill, Wabash, and A. G. Wells, Marion, Ind. John H. Wade was elected President and Treasurer. It was agreed in the meeting of the Board of Directors to extend the road from Goshen north via Elkhart to Benton Harbor, Mich., and from Anderson south to Knightstown. Work will be commenced at once.

The Bankers' and Merchants' Telegraph Company has been organized and incorporated, with a capital of $1,000,000. The company is to build lines between Boston and Washington, by way of New York, Philadelphia and Baltimore. The stock has all been taken by bankers, brokers and merchants in New York, Boston and Philadelphia. The officers of the company are as follows: President, W. W. Mavis, of Mavis & Smith, bankers, Philadelphia; Vice-President, A. W. Dimock, of A. W. Dimock & Co., bankers, New York; Treasurer, J. H. Crossman, of F. M. Lockwood & Co., bankers, New York, General Superintendent, G. S. Mott, late Superintendent of the Atlantic & Pacific Telegraph Company; Secretary, Gere G. Case, late of the Continental Telegraph Company.

CONTRACTING, MISCELLANEOUS, ETC.

A light-house is to be built on Borden's Flats, off Fall River, Mass.

Fayette County, Ohio, declines to spend $100,000 for a new court house.

$50,000 of the Silas Bronson fund are now available for building a public library at Waterbury, Conn.

The plans for the Kingston, Ont., cotton mill have been received. The building will be 203 by 73 feet, and about 40 feet in height.

The Lake Company has contracted to do the dredging at the Weirs, N. H., for which $75,000 was appropriated, and work will be begun by the middle of May.

Messrs. Bartlett & Co., of Baltimore, Md., being the lowest bidders, have been awarded the contract for the iron roof of the Cincinnati Custom House and Post-office, at their bid of $110,000.

The contract for 48 miles of the extension of the New York, Ontario & Western Railroad from Schenectady to Little Falls, has been let to John Hunter, of Sterling Valley, N. Y. That portion of the road between Little Falls and Oneida will be let next week.

The premium in the Cotton Exchange competition of New Orleans, La., has been awarded to Mr. H. Wolters, of Louisville, Ky. Fifteen designs were received in time, March 15; two more, received March 21, were not opened.

Caldwell & Neely have been awarded the contract for constructing the first twenty-seven miles of the Chicago, Texas & Mexican Central Railroad. President Hale says fifty miles of the road will be completed by Sept. 1.

The Northampton County, Pa., Commissioners have awarded the contract for building an additional structure at the poor-house, 40x100 feet, 2½ stories, to Charles Harwi, of South Bethlehem, for $14,849.50.

The contracts for completing the North Carolina extension of the East Tennessee road to the North Carolina State line will be awarded to-morrow. Trains will run direct from Knoxville to Charleston by the beginning of next winter.

D. T. & J. S. Casement, of Painesville, have been awarded the contract for building the New York, Chicago & St. Louis Railroad from Cleveland to Brockton, N. Y. The contract also includes the track laying from Brockton to Buffalo.

Mr. H. W. Hartwell, architect, of Boston, is now preparing drawings for a church and school-house, to be built on an estate in Essex County, Mass. The church measures 60×67 ft., with tower 100 ft. high; and the school-house contains one large school-room and two chambers over it. The materials used will be stone and carved brick, and the cost about 30,000.

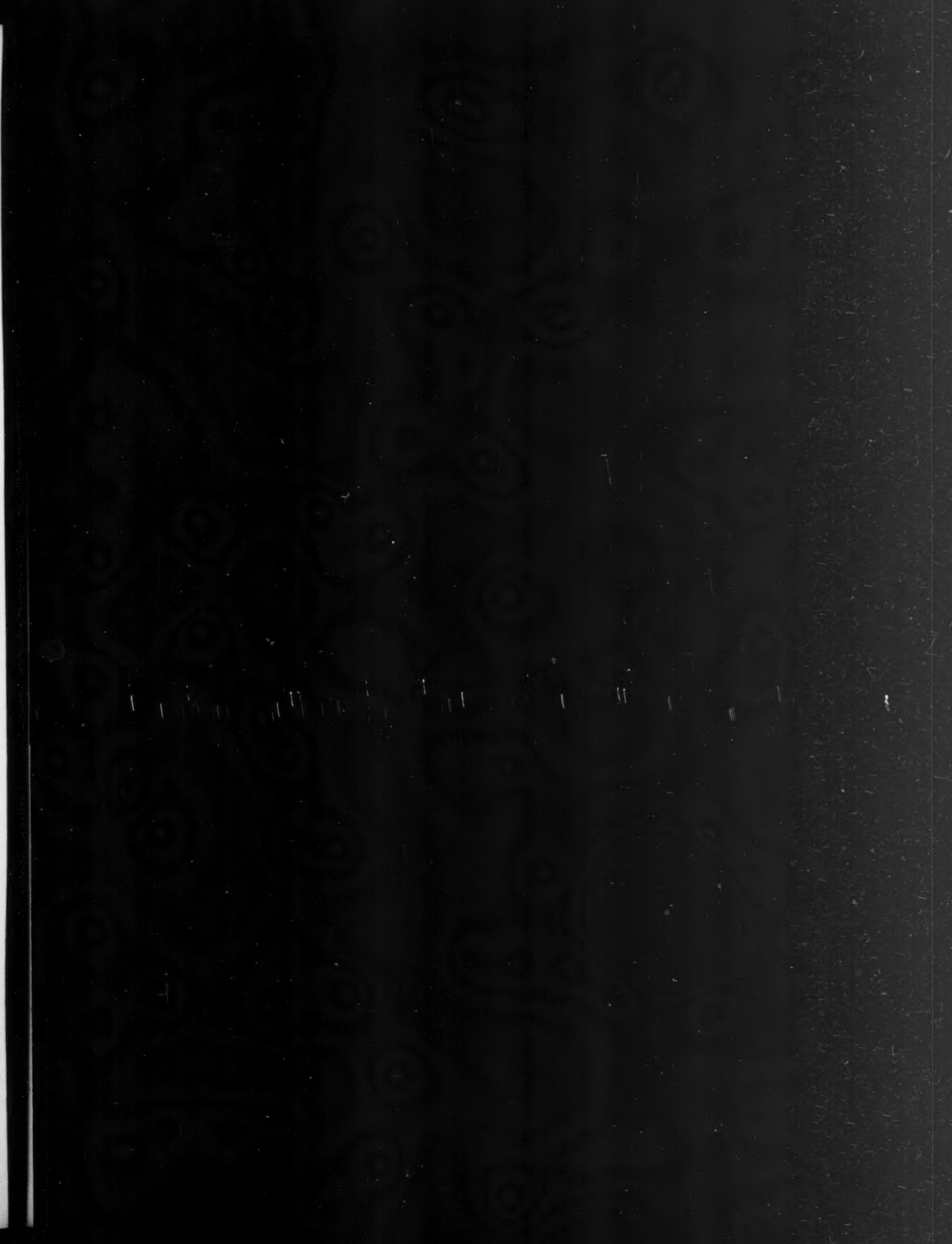
STEEL RAILS IN HOLLAND.—Advices from Brussels state that contracts have been let for 4,000 tons of steel rails and 353 tons of accessories for the Netherlands State Railways. The lowest tender was that of the Angleur Steel Works Company, £34,673. Messrs. Bolckow, Vaughan & Co. (limited), tendered at £37,871.

The Cape Cod canal company is again brought into notice by the postponement of the adjustment between the New York company and Dresbach & Skillman, the late contractors. Some interesting lawsuits are expected on account of the damage done by the laborers to private property unless the Boston company assumes the liabilities.

A LARGE CONTRACT FOR IRON ORE.—A gigantic contract has just been concluded by American firms for the delivery, in three years, of 800,000 tons of iron ores of the Mokta Company (Algeria), at the price of 14s. 5d., f. o. b. Bona. By this contract the company of Mokta disposes of nearly their total production, amounting to 400,000 tons yearly, their previous engagements balancing the surplus.

KNOXVILLE, Tenn., April 19.—To-day contracts were awarded to five companies out of the thirty-nine which bid yesterday on the Knoxville & Ohio Railroad to complete it to the Kentucky State line. Eight sections were awarded to J. M. Condon & Co., of Knoxville; four to J. D. Offutt, of Tennessee; two to Martin Shea, of Knoxville; two to Myer, Hay & Co., of Shelbyville, Ky.; and two to J. L. Offut, of Knoxville. Work will begin immediately and will be pushed with all possible speed.

The carpenters, brick-masons and freestone-cutters of Cincinnati, O., are all out on strike. The carpenters and freestone-masons have quitted work, and the brick-masons will do the same on the first of May unless their demands are acceded to. The strike of the freestone men is for $3.00 per day and to have no men of less pay. The bosses will give the $3.00 per day, but demand a $2.50 per day grade, as some men are not worth as much as others. The "jours" rejected this proposition, and say that after the first of May the strike will be for $4.00 per day unless the matter is sooner accommodated. The organizations of both the "jours" and the bosses are strong, and each are determined to hold out, and so lively times are looked for.

The strike of the carpenters is for 25 per cent. advance. The bosses offered 25 cents advance, but this was rejected. This strike is not so formidable as that of the freestone men, and will probably be easily compromised.

No trouble is anticipated at present from the other branches.